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1968

ANNUAL REPORT

PACIFIC NORTHWEST
forest and range experiment station
u.s. dept. of agriculture
forest service portland, oregon

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IN GENERAL

1968 will be remembered as the year man first observed directly the far side of the moon. As did previous years, 1968 also marked progress toward finding answers to the ever-expanding earthly problems of how best to manage, protect, and use forests, ranges, and watersheds.

Space age techniques as well as more traditional methods were employed by the Pacific Northwest Forest and Range Experiment Station and her many research partners. The Station's 152 scientists continued to cooperate in many joint programs with fellow researchers, universities, private research foundations, forest industries, and government resource agencies. Their findings covered a wide range of scientific disciplines.

To illustrate briefly the diversity and complexity of the broad research program, here are a few developments which occurred in the past year:

A quick accurate means of assessing hemlock sawfly populations in Alaska; a picloram treatment for salmonberry control; and a new taper and volume table for red alder.

Economical ways to reduce noises heard through apartment unit walls; methods to determine forest seed sources by cotyledon counts; and SORAC, a computer program designed to calculate allowable harvests and be applicable to any resource management situation.

Techniques for identifying highly unstable Alaskan slopes which will slide if forest cover is harvested; an air pycnometer which quickly and accurately measures capability of soil to receive, transmit, and store water; and a nonchemical way to reduce needle-mining midge attacks in Christmas tree plantations.

Findings were issued in some 200 publications including research papers, journal articles, research notes, resource bulletins, and miscellaneous articles.

The resources necessary to increase the efficiency of research were activated with the dedication of two new research laboratories, key staff additions, increased funds at the Silviculture Laboratory in Bend, Oregon, and completion of additional greenhouse facilities at the Forest Hydrology Laboratory in Wenatchee, Washington.

Several key staff changes and additions occurred. We were saddened by the death of **Dr. Kenneth W. Krueger** who died in July. He came to the Station in 1957 from the University of Idaho, first specializing in forest disease research, later in timber management research.

David Tackle is now Assistant Director, Timber Management Research, following the retirement of **George S. Meagher. Dr. Glenn L. Crouch** succeeded Tackle as project leader in charge of Animal Damage Control at Olympia, Washington. He is continuing his research on reduction of animal damage through modification of the forest environment.

Dr. J. Alan Wagar came to the Station as leader of a new cooperative recreation research project at the University of Washington. His interests include the ecological impacts of recreation use, recreation-use measurement, and related fields. Wagar formerly was leader of a similar project at Utah State University with the Intermountain Station.

Dr. Glen O. Klock's assignment at our Forest Hydrology Laboratory, Wenatchee, Washington, is related to soil stability problems on critical watersheds east of the Cascade Range. He joins a team responsible for developing criteria for rehabilitating unstable soils. Dr. Klock is a 1968 Oregon State University graduate in soil physics.

Dr. Jon M. Geist, a 1968 graduate from Colorado State University, is now with the Range Environmental Ecology Project at LaGrande, Oregon. His undergraduate training was in forestry and range management, and his Ph.D. in soil science. He will be working on an interdisciplinary team studying problems associated with harmonizing forage, wildlife, water, and timber use on east-side forest and ranges.

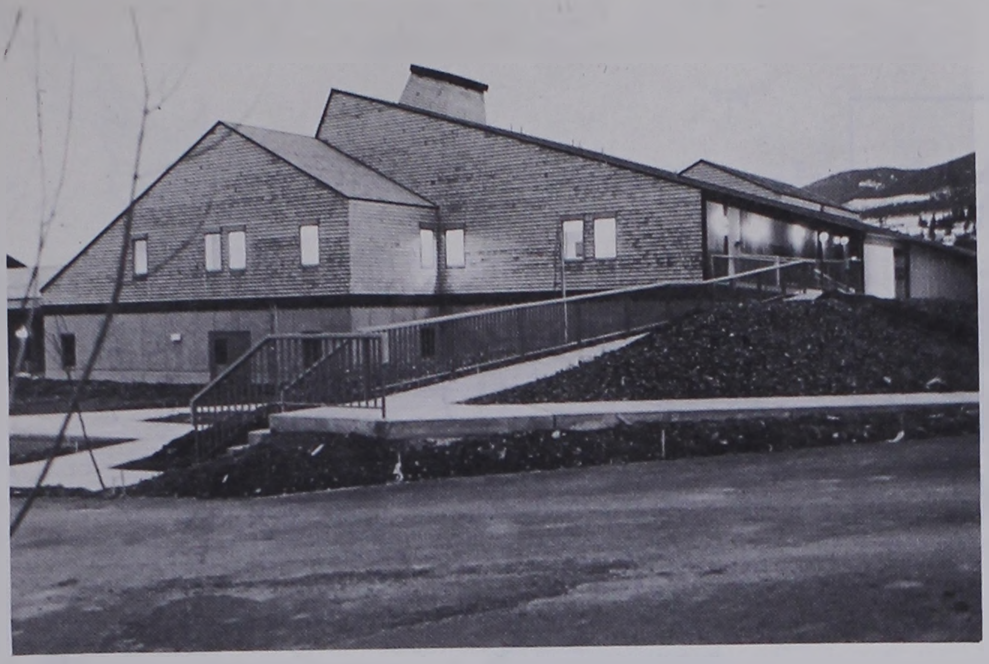
Dr. Dennis L. Schweitzer has joined the Economics Research group in Portland, where he will conduct timber investment analyses with special emphasis on multiple use management. He will also continue work begun at the North Central Forest Experiment Station in developing analytical techniques for dealing with the risks associated with timber management decisions. **Dr. Thomas E. Hamilton** was named project leader for Marketing Forest Resources, Portland, following the resignation of John Beuter. Dr. Hamilton will lead studies of alternative marketing practices for standing timber, forest industry market structure, and Pacific Rim marketing problems.

At our Institute of Northern Forestry, **Dr. John C. Zasada** has joined the Ecology of Sub-Arctic Trees and Forests Project at College, Alaska, where he will make use of his broad background in tree physiology and tree-soil-water relationships.

Dr. Donald M. Knutson, forest pathologist, is now on the staff of the Diseases Reducing Forest Production Project at Corvallis, Oregon. His research will be concerned mainly with dwarf mistletoes of conifers.

Dr. Thomas W. Childs, forest pathologist and leading authority on *Poria weirii* root rot of Douglas-fir, retired in January after 39 years' service with the Department of Agriculture.

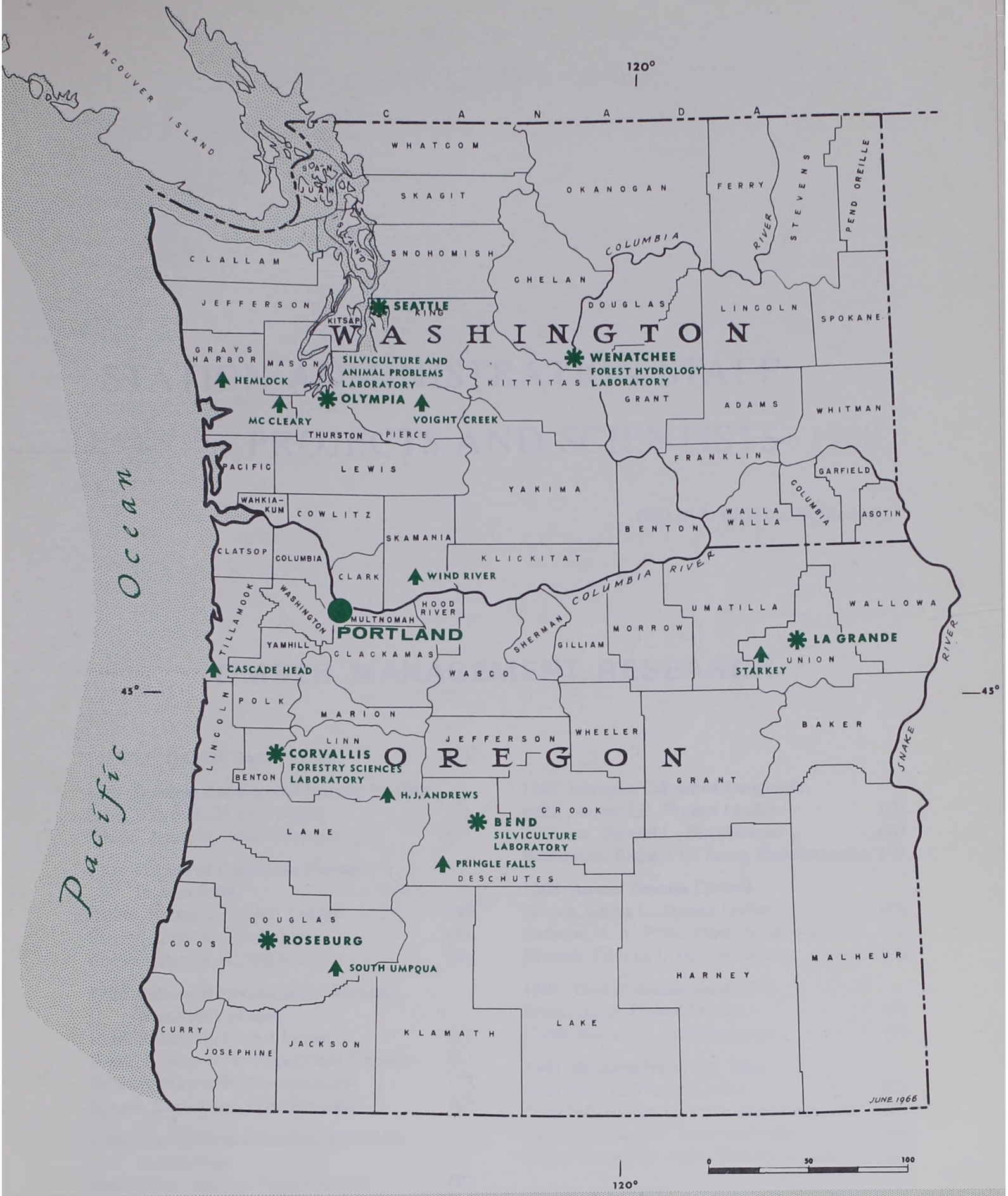
The following pages outline the staff and research project organization and show the location of the main U.S. Forest Service research installations in Oregon, Washington, and Alaska in 1968. Some 1968 research developments at the Station are highlighted. More detail on these and other research progress may be found in the publications issued during the year and listed in the final section. We shall welcome inquiries about any of these as well as suggestions on any part of the Station's activities.



The new LaGrande Range and Wildlife Habitat Laboratory was dedicated in October. The 4-acre site on the Old Oregon Trail is leased to the Forest Service by Eastern Oregon College of Education. This laboratory provides efficient facilities for the Big-Game Habitat and Range Environmental Management Projects. The building emphasizes contemporary uses of wood products grown in the Pacific Northwest.

The new Forestry Sciences Laboratory, 5 miles south of Olympia, Washington, was dedicated in April. The building, a fine example of the harmonizing of native woods and concrete, is on a 10-acre site leased from the Washington State Department of Natural Resources. It provides modern and efficient facilities for the Animal Damage Control and the Intensive Culture of Douglas-fir projects and for the cooperating Forest-Animal Unit research group of the U.S. Bureau of Sport Fisheries and Wildlife.

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION



FOREST SERVICE ... U.S. DEPARTMENT OF AGRICULTURE

STATION ADMINISTRATION STAFF

PROJECTS AND SCIENTISTS--1968

PHILIP A. BRIEGLEB, Director

TIMBER MANAGEMENT RESEARCH

TACKLE, DAVID, Asst. Director (P)[1]

1201 Seeding, Planting, and Nursery Practice
Stein, William I., Project Leader (P)
Edgren, James W., Plant Ecologist (P)

1203 Culture of Coniferous Forests, Interior PNW
Dahms, Walter G., Project Leader (B)
Barrett, James W., Silviculturist (B)
Cochran, Patrick H., Soil Scientist (B)

1204 Culture of Mixed-Conifer Forests, West-Side Cascades
Ruth, Robert H., Project Leader (C)
Franklin, Jerry F., Principal Plant Ecologist (C)
Herman, Francis R., Mensurationist (C)
Minore, Don, Assoc. Plant Ecologist (C)

1206 Brushfield Reclamation, Prevention and Ecology
Gratkowski, Henry J., Project Leader (R)

1207 Intensive Culture of Douglas-fir
Miller, Richard E., Project Leader (O)
Reukema, Donald L., Silviculturist (O)
Williamson, Richard L., Assoc. Mensurationist (O)

1208 Animal Damage Control
Crouch, Glenn L., Project Leader (O)
Radwan, M. A., Princ. Plant Physiologist (O)
Dimock, Edward J. II, Silviculturist (O)

1301 Timber Measurement, PNW
Bruce, David, Project Leader (P)
Curtis, Robert O., Mensurationist (P)

1401 Breeding Northwest Trees
Silen, Roy R., Project Leader (C)
Campbell, Robert K., Princ. Plant Geneticist (C)
Sorensen, Frank C., Plant Geneticist (C)
Copes, Donald L., Assoc. Plant Geneticist (C)

WATERSHED, RECREATION, RANGE, AND WILDLIFE HABITAT RESEARCH

HARRIS, ROBERT W., Asst. Director (P)

1601 Water Yield Improvement and Erosion Reduction, East-Side Cascades
Berndt, Herbert W., Project Leader (W)
Fowler, William B., Meteorologist (W)
Herring, Harold G., Hydrologist (W)
Klock, Glen O., Soil Scientist (W)
Lopushinsky, William, Plant Physiologist (W)

1602 Erosion and Sediment Reduction, West-Side Cascades
Rothacher, Jack S., Project Leader (C)
Dyrness, C. Theodore, Princ. Soil Scientist (C)
Fredriksen, Richard L., Soil Scientist (C)

1603 Pollution of Forest Environment
Tarrant, Robert F., Project Leader (C)
Bollen, Walter B., Princ. Soil Microbiologist (C)
Moore, Duane G., Soil Scientist (C)
Norris, Logan A., Chemist (C)

1701 Range-Environmental Ecology
Garrison, George A., Project Leader (L)
Geist, Jon M., Soil Scientist (L)
Strickler, Gerald S., Plant Ecologist (L)

1801 Big-Game Habitat – PNW
Smith, Justin G., Project Leader (L)
McConnell, Burt R., Plant Ecologist (L)
Dealy, J. Edward, Assoc. Plant Ecologist (L)
Edgerton, Paul J., Assoc. Plant Ecologist (L)

1901 Wildland Recreation
Hendee, John C., Project Leader (S)

1902 Cooperative Forest Recreation, University of Washington
Wagar, J. Alan, Project Leader (S)

FOREST PROTECTION RESEARCH

WRIGHT, KENNETH H., Asst. Director (P)

2103 Fuel Appraisal
Fahnestock, George R., Project Leader (S)
Morris, William G., Forest Fuels Specialist (S)
Lund, Herluf G., Assoc. Photogrammetrist (S)

2105 Cooperative Forest Fire Science, University of Washington
Murphy, James L., Project Leader (S)

2201 Forest Insects of the Pacific Northwest
Wickman, Boyd E., Project Leader (C)
Mitchell, Russel G., Insect Ecologist (C)
Mason, Richard R., Insect Ecologist (C)
Sartwell, Charles, Jr., Assoc. Insect Ecologist (C)

2203 Diseases of Western Forest Insects
Thompson, Clarence G., Project Leader (C)
Martignoni, Mauro E., Princ. Microbiologist (C)
Maksymiuk, Bohdan, Princ. Entomologist (C)

2204 Nutrition and Behavior of Forest Insects – PNW
Carolin, Valentine M., Jr., Project Leader (P)
Ryan, Roger B., Entomologist (C)
Schmidt, Fred H., Entomologist (C)
Coulter, William K., Assoc. Entomologist (P)
Daterman, Gary E., Assoc. Entomologist (C)

2301 Forest Diseases of the Pacific Northwest
Shea, Keith R., Project Leader (C)
Aho, Paul E., Plant Pathologist (C)
Harvey, George M., Plant Pathologist (C)
Knutson, Donald M., Assoc. Plant Pathologist (C)

2302 Western Root Diseases and Soil Microbiology
Trappe, James M., Project Leader (C)
Zak, Bratislav, Princ. Plant Pathologist (C)
Lu, Kuo C., Principal Microbiologist (C)
Nelson, Earl E., Plant Pathologist (C)

FOREST SURVEY, FOREST ECONOMICS, FOREST PRODUCTS, MARKETING AND UTILIZATION, AND ENGINEERING RESEARCH

FLORA, DONALD F., Asst. Director (P)

3101 Grade and Quality of Western Timber
Lane, Paul H., Project Leader (P)
Henley, John W., Wood Technologist (P)
Woodfin, Richard O., Jr., Wood Technologist (P)
Plank, Marlin E., Assoc. Wood Technologist (P)
Pong, Wee Yuey, Assoc. Wood Technologist (P)

3602 Wood Construction and Use Concepts
Grantham, John B., Project Leader (S)
Heebink, Thomas B., Princ. Research Engineer (S)
Oviatt, Alfred E., Jr., Princ. Research Architect (S)

3701 Forest Engineering Systems
Lysons, Hilton H., Project Leader (S)
Binkley, Virgil W., Logging Engineer (S)
Carson, Ward W., Mechanical Engineer (S)
Mann, Charles N., Mechanical Engineer (S)
Vigna, Carl P., Designer (S)

4101 Forest Survey – Pacific Coast
Metcalf, Melvin E., Project Leader (P)
Gedney, Donald R., Resource Analyst (P)
Berger, John M., Mensurationist (P)
Bolsinger, Charles L., Assoc. Mensurationist (P)
Hazard, John W., Assoc. Mensurationist (P)
Oswald, Daniel D., Assoc. Resource Analyst (BC)
Wall, Bryan R., Assoc. Economist (P)

4102 Survey Techniques – PNW
Pope, Robert B., Project Leader (P)
Haack, Paul M., Jr., Mensurationist (P)
MacLean, Colin D., Mensurationist (P)

4201 Evaluation of Timber Growing Opportunities and Forestry Programs – Pacific Coast
Schallau, Con H., Project Leader (P)
Schweitzer, Dennis L., Economist (P)
Randall, Robert, Assoc. Economist (P)

4301 Improvement of Methods for Marketing Forest Resources
Hamilton, Thomas E., Acting Project Leader (P)
Adams, Thomas C., Economist (P)

BIOMETRICS

JOHNSON, FLOYD A., Biometrician (P)

RESEARCH SUPPORT SERVICES

PETERSEN, CHAS. J., Assistant Director (P)
Calvert, Lorne M., Operations (P)
Martin, Dorothy E., Programing and Statistics (P)
Newlon, Charles J., Information and Education (P)
Knutson, Maurice C., Library (P)
Hansen, George M., Publications (P)
DiBenedetto, A.P., Architecture/Engineering (P)

INSTITUTE OF NORTHERN FORESTRY

HURD, RICHARD M., Director (J)

1210 Culture of Coastal Forests – Alaska
Harris, Arland S., Project Leader (J)
Farr, Wilbur A., Assoc. Research Forester (J)

1211 Ecology of Subarctic Trees and Forests
Viereck, Leslie A., Project Leader (CA)
Zasada, John C., Research Forester (CA)

1604 Erosion and Sediment Reduction – Alaska Coastal Forests
Helmers, Austin E., Project Leader (J)
Meehan, William R., Fishery Biologist (J)
Swanston, Douglas N., Assoc. Geologist (J)

2106 Fire Control Methods – Alaska
Barney, Richard J., Project Leader (CA)
Noste, Nonan V., Assoc. Res. Forester (CA)

2206 Forest Insects – Coastal Alaska
Schmiege, Donald C., Project Leader (J)
Hard, John S., Entomologist (J)
Torgersen, Torolf R., Entomologist (J)

2207 Forest Insects – Interior Alaska
Beckwith, Leroy C., Project Leader (CA)

4103 Forest Survey – Alaska
Hutchison, O. Keith, Project Leader (J)
Hegg, Karl M., Assoc. Research Forester (J)
LaBau, Vernon J., Assoc. Research Forester (J)
Laurent, Thomas H., Assoc. Research Forester (J)

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[1] (P) Portland, Oregon
(C) Corvallis, Oregon
(B) Bend, Oregon
(W) Wenatchee, Washington
(O) Olympia, Washington
(L) La Grande, Oregon
(R) Roseburg, Oregon
(S) Seattle, Washington
(BC) Berkeley, California
(J) Juneau, Alaska
(CA) College, Alaska

SOME HIGHLIGHTS OF 1968 DEVELOPMENTS

Forest Fire Science

The Station's Forest Fire Science Project began cooperatively with the University of Washington in 1967 and made headway toward attaining its objectives:

1. Develop graduate programs in forest fire science and technology.
2. Train graduate students in forest fire science.
3. Perform cooperative forest fire research.

Master of forestry, master of science, and several Ph.D. programs have been formulated on a test basis. The master of forestry program, designed for the forest fire manager, emphasizes forest fire behavior and forest fire management, including scientific decisionmaking. There were three Ph.D. students and two master of forestry students in the program during the 1967-68 academic year. During fall quarter 1968, five Ph.D. students and two master's students enrolled.

Fire Hazard from Precommercial Thinning

For at least 5 years after well-stocked young stands of ponderosa pine are thinned to 12- by 12-foot or wider spacing by felling, without slash disposal, fire rate of spread and resistance to control remain high, by Forest Service fuel-type standards. The quantity of available fuel can be calculated in various ways, but use of "normal" stand tables gives estimated weights per acre of 15 to 35 tons. Use of tallies of "cut" trees on 22 plots in central Oregon resulted in somewhat higher available-fuel estimates, with the maximum exceeding 100 tons when 3,800 trees per acre were cut in a 30- to 40-year-old site IV stand.

In August 1968, the 25,000-acre Fourth of July Mountain fire on the Wenatchee National Forest burned about 2,000 acres of precommercial thinning slash that was 6 to 18 months old. Observations after the fire indicated that, in thinned stands, 41 tons of fuel per acre burned during the period of high-intensity combustion. This is about 80 percent more with heat output 100 percent greater than in unthinned stands.

Obviously, fire in thinning slash can breed disaster. Just as surely, failure to thin as much acreage as there is money available seriously reduces forest productivity. A compromise must be reached between maximum production and risk – no slash disposal – and minimum production and risk – 100-percent disposal. Factors forest managers should consider include: likelihood of fire occurrence, amount and distribution of slash created, ability to control high-intensity fires, and values involved. Research Paper PNW-57 provides a useful new means of rating the hazard.

Forest Residues: Problem and Opportunity

In Oregon and Washington, logging annually creates about 23.5 million tons of coarse residues (larger than 3 inches in diameter and at least 4 feet long) and 15.9 million tons of finer slash. Most of this material is on clearcuts in the Douglas-fir region, west of the crest of the Cascade Range. More than 7 million tons of slash are burned annually, again mostly west of the Cascades, for several purposes, notably fire hazard reduction and site preparation for regeneration. The benefits from burning have not always been clarified, and now the practice is being attacked as a possible source of air pollution. Thus, public pressure threatens to curtail a practice many foresters consider desirable.

Conversion of more logging residues to useful products could have twin benefits: increased income and reduction in the amount of slash

burning needed. Sound coarse residues represent an estimated $42 million unused resource at 1966 chip prices. Total value to the regional economy could be a quarter of a billion dollars. Although fine slash comprises most of the material that is burned for fire hazard reduction, removal of all coarse residues can so rearrange the fines that burning or other additional treatment is unnecessary. Much of the reason for present nonuse of large residues is systemic – inefficient methods of measurement and pricing – rather than technological. The time is ripe for accelerated research that will point the way for maximum use of logging residues, with optimum effect on future timber management and the total environment. With the help of cooperators, the PNW Station is planning such research.

Waterdropping for Alaskan Forest Fires

Aerially applied fire retardant is a costly item in suppressing interior Alaska forest and range fires and alternate approaches for fire suppression are being investigated. Because of numerous streams, lakes, rivers, and potholes throughout the interior, waterdropping is a potential alternative. Last summer, we initiated a study to determine water requirements for suppressing fires in fine fuels. The results of use of helicopter waterdropping techniques indicate a good potential in both fire suppression and mopup activities.

The Bureau of Land Management utilized helicopter waterdropping on an operational basis concurrently with our testing program. Approximately 1,035,100 gallons of water were dropped on fires for an estimated cost of 4 to 12 cents per gallon. Cost for 933,000 gallons of retardant dropped was estimated at $1 per gallon. Continued investigation should show where and how we can best use aerially applied water.

Phenolic Compounds Inhibit *Poria weirii*

Phenolic compounds in plants are associated with resistance to disease. In recent laboratory tests, nine out of 25 common phenolics inhibited *Poria weirii.* Presence of these or other inhibitors in *Poria*-resistant plants such as red alder indicates a chemical resistance mechanism. Moreover, leaching of the inhibitors and their fungitoxic derivatives from alder litter, or normal secretion from alder roots,could account in part for the reduced longevity of *P. weirii* in soil under alder. One of the inhibitory compounds, ferulic acid, has also been reported as a trace component of Douglas-fir bark. This suggests a possibility for increasing resistance of Douglas-fir roots to *P. weirii* by increasing their levels of ferulic acid or other inhibitory compounds through genetic or physiological methods.

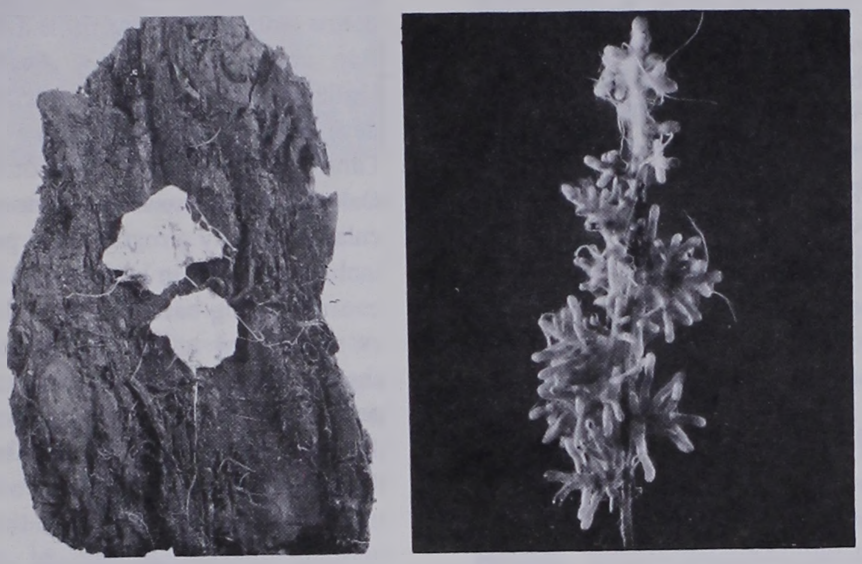
Helicopter waterdropping calibration test carried on through cooperation with the Bureau of Land Management and the U.S. Army at Ft. Wainwright, Alaska.

Mycorrhiza Classification

Certain mycorrhizal fungi are known to strongly protect rootlets from disease. Application of this knowledge in biological control of root diseases has been hindered by the difficulty of identifying the many different types of mycorrhizae that occur in nature. Now, however, the basic concepts and techniques for classifying mycorrhizae have been developed and are being applied to Douglas-fir. One distinctive type of Douglas-fir mycorrhiza was discovered to be formed with *Poria terrestris*, a member of a family that also contains many serious root pathogens. With fungi as with people, perhaps even "outlaw" families produce some "good guys."

females in 1964 laid an average of only 49 (range 21-65) eggs and the population declined abruptly the following year. In 1968, sawfly females laid an average of about 40 (range 12-73) eggs in an area near Sitka and a sharp population decline is predicted. Preliminary checks for eggs this fall have borne this out as few eggs were found.

A rapid survey technique for the egg stage of the hemlock sawfly in coastal Alaska is nearing completion. Sampling is confined to the upper crowns of intermediate crown-class trees. Percent of sample units bearing one or more eggs, rather than actual number of eggs, provides a quick estimate of sawfly population within an infested stand.



Although most species of *Poria* are wood decayers and one, *P. weirii*, causes a serious root rot of Douglas-fir, at least one, *P. terrestris*, is mycorrhizal and most probably beneficial. Illustrated are sporocarps (left) of the blue-staining form of *P. terrestris*, X 0.7, and the respective Douglas-fir mycorrhiza (right), designated *Pseudotsuga menziesii* + *Poria terrestris* (blue-staining), X 2.7.

Predicting Insect Populations in Alaska

The egg-laying ability of female hemlock sawflies will be used as an indicator of population trends in southeast Alaska. The average number of eggs per female in 1963 was 72 (range 20-112); the population was healthy; and the 1964 larval population was as high or higher than in 1963. The

Douglas-Fir Resistance to Midge Attack

A needle-mining midge (*Contarinia pseudotsugae*) seriously damaged Douglas-fir Christmas tree plantations near Corvallis, Oregon. Studies of the attack pattern of this insect in relation to the time of bud burst in Douglas-fir suggest a method of cultural control. It was noted that midges need

newly expanded buds on which to lay their eggs; further, the range in time of bud burst exceeded the main flight period of the insect. An analysis of this relationship showed that the amount of insect damage decreased significantly with the lateness of bud burst. Accordingly, by selecting plantation stock from ecotypes or individual parents with late bud-bursting characteristics, the Christmas tree grower should be able to significantly reduce damage from this insect without resorting to chemical treatments.

Insect Control Based on Behavioral Facts

The development of sophisticated methods for controlling forest insects demands better knowledge of the behavior of the pest insect. One such method is the liberation of sterilized males. In cooperation with Washington State University, the Station is field-testing control of this insect by liberation of European pine shoot moth males that have been sterilized by gamma radiation.

In preparation for this test, Station research has been aimed at aspects of shoot moth behavior and recognition of problem areas. In the wild, male moths usually appear ahead of the females and are "available" when female moths emerge. Thus, we visualize the first release of sterilized males as being made slightly in advance of wild male emergence to gain an advantage in mating with, and thus neutralizing, females. Other releases would follow at intervals based on moth longevity and peaks in seasonal emergence. All releases would provide a large numerical superiority of sterilized males over wild males.

One problem area was detected this year. Tests in which uninfested pines were used showed that most liberated males, both normal and sterilized, were unable to find the host plant, except by chance. Some undoubtedly flew out of the test area. However, other tests have shown that once females emerged, males had a means of orientation, and released males were lured by caged virgin females over distances up to 282 feet.

A solution to this potential problem with an early release of sterilized males is to bait groups of trees with extracts of the female sex attractant, until females appear. Since the liberated sterilized males will greatly outnumber wild males, the use of the attractant extracts should maintain this advantage and provide opportunity for effective control.

Virus Preparations Purified

One of the problems faced in the development of microbial biological control measures for insect pests has been removal of micro-organisms and organic debris from the pathogen preparations. Laboratory studies of a virus disease of the Douglas-fir tussock moth have shown that the buoyant density of the virus inclusion bodies is sufficiently different from that of contaminating debris and micro-organisms to permit concentration of bacteriologically clean inclusion bodies. Utilizing a gradient centrifugation technique developed at the Corvallis Forestry Sciences Laboratory, and centrifuge rotors developed at the Oak Ridge National Laboratory under the Molecular Anatomy program, we produced pure virus inclusion bodies in large quantities. The number of contaminating bacteria was reduced by a factor of as much as 4 million. Large-scale purification of these virus inclusion bodies may have very important industrial as well as scientific applications. An advisory committee to the Food and Drug Administration has recommended that an insect virus formulation for use in the field ". . . should contain minimal residue of insect tissues and medium" and that freedom from bacteria ". . . should be taken as an index of good manufacturing processes." The new purification process will enable the Forest Service and industry to comply with these recommendations.

Pine Needle Cast Damage Evaluated

Elytroderma needle cast intermittently causes severe local damage to ponderosa pine forests in eastern Oregon and Washington. Studies soon to be published show growth rates are reduced approximately in proportion to crown damage. Uncrowded saplings and poles with healthy leaders can recover from rather severe infections if not

Crown damage to ponderosa pine caused by Elytroderma needle cast.

attacked by other parasites while weakened. We also found that extensive crown damage in mature stands is permanent. Heavily infected trees frequently are killed directly by defoliation, and moderately infected trees are more susceptible to root disease and insect attacks. Despite its alarming appearance, the disease does not threaten to eliminate ponderosa pine. Recommendations for reducing losses in conspicuously infected mature stands include: (1) do not take hasty action; appreciable damage will not occur until a few years after the outbreak; (2) evaluate the situation annually in spring and early summer; (3) schedule logging immediately whenever mortality and beetle populations increase; (4) discriminate against infected trees when logging lightly infected stands; and (5) cut heavily or plan to relog within a year or so in moderately to heavily infected stands.

Reducing Douglas-Fir Mortality From Bark Beetles

Douglas-fir bark beetle mortality in young-growth stands 70 to 150 years old may be reduced 60 percent through thinning. Nine study areas scattered throughout the Douglas-fir type in western Washington and Oregon support this estimate. These study areas have been observed for an average of 13 years with observation periods ranging up to 38 years. In addition to redistributing growth to fewer, higher quality trees and providing an earlier income, thinning appears to have improved health and vigor of residual trees. This latter effect is believed to be primarily responsible for the observed reduction of bark-beetle mortality.

The experience of these plots through the 1952 and 1968 bark-beetle epidemics indicates a major advantage of thinning over sanitation-salvage cutting. Thinning can evidently prevent such epidemics in mature young growth and, perhaps more important, eliminate normal, endemic, bark-beetle mortality.

Pocket Gophers--A Major Enemy of Conifers

Pocket gophers are a major factor impeding reforestation on many National Forests in the Pacific Northwest. Results obtained from a questionnaire sent to all Ranger Districts in Region 6 showed that gophers and porcupines ranked second to deer as animals causing damage to growing trees.

Pocket gophers are particularly harmful because their actions usually result in tree mortality. In a study currently underway on the Chiloquin Ranger District, gophers destroyed 65 percent of an experimental planting of lodgepole, ponderosa, and Jeffrey pines between the planting date in March 1966 and October 1968. More than 80 percent of the losses occurred during the winter.

Such losses strongly suggest the reason for failure of plantations totaling hundreds of acres on the Cave Mountain Burn where the study is located.

Do Animals Prefer Nursery Stock?

Over the years, many have concluded that nursery stock is browsed and clipped by wildlife more than natural seedlings are. Research at Olympia has shown this to be a highly questionable assumption and suggests that – for a short period after planting – even the reverse may be true.

Studies on 10 widely separated areas in western Washington compared wildlife damage to Douglas-fir seedlings of both natural and nursery origin. Twelve months after seedlings were planted, snowshoe hare and mountain beaver had clipped natural seedlings more than nursery stock in 17 out of 20 comparisons. They also preferred transplanted wildlings over nursery seedlings in 16 out of 20 instances. Differences in damage, however, were not large. During the second year, no consistent preferences were detected. Deer showed no obvious preferences, although some seedlings were browsed on each study area.

Evidence remains lacking that nursery association increases seedling susceptibility to animal damage.

Eastern Oregon Deer and Elk Prefer the Open Forest for Food

Wildlife is an integral part of the forest environment and a vital factor in multiple use forestry. Research studies are determining how to make big-game use compatible with other uses of nearly 5 million acres of dense and open forest and grasslands.

Seasonal food preferences and abundance have been rated on a deer-elk range in eastern Oregon. Open forest rated highest in all seasons due mainly to an abundance of elk sedge, a preferred grasslike plant. Grassland rated a close second in the spring when succulent flowering plants were abundant. However, it dropped to third during the summer and fall periods when grassland plants became dry and unpalatable. Deer and elk then sought food as well as cover in the forest habitats. Low-growing shrubs contributed most to the dense forest rating. The grassland rating rose slightly in the fall when a small amount of regrowth occurred on grasses.

Grazing of Clearcuts on the East Side

First-year results of cattle grazing on a 45-acre mixed-conifer clearcut shows no damage to planted trees. Four years after the clearcut was planted to ponderosa pine and timothy, it was grazed by 19 cows with their calves and one bull for 71 days during midsummer to late summer. No grazing or trampling damage to trees occurred on 30 unprotected sample plots within the planted area.

This 45-acre clearcut on the Umatilla National Forest provided 47 animal unit months of forage, or approximately 1 acre per AUM. In comparison, good condition native ponderosa pine range requires 7-1/2 acres per AUM. There are 8 million acres of mixed-conifer and lodgepole pine forest in eastern Oregon and Washington with a potential of providing increased amounts of summer forage for livestock and big game during the first 10 to 20 years of the regeneration period.

Oblique aerial view of patch cut. Cutover area in foreground has been rehabilitated with tree planting and ground cover seeding.

Germination of Redstem Ceanothus Seeds

A laboratory-greenhouse experiment has demonstrated that dormant seeds of redstem ceanothus (*Ceanothus sanguineus*) are induced to germinate by heat such as wildfires or logging slash fires.

Soil temperatures of 60°C. or less did not cause the seeds to germinate. A few seeds germinated after exposure to 75°C. soil temperatures, but maximum germination was obtained from seeds exposed to soil temperatures of 105°C. Although statistical analysis is not yet completed, germination appears to have decreased somewhat with increasing duration of exposure to a soil temperature of 120°C. The 135°C. soil temperature killed redstem ceanothus seeds of this seed lot. Duration of exposure from 4 minutes (minimum) to 40 minutes (maximum) had no effect on germination at soil temperatures up to and including 105°C.

Soil temperatures within the range that will induce germination of redstem ceanothus seeds are produced during burning of logging slash in cuttings. Burning small accumulations of logging slash is most apt to produce soil temperatures that will induce germination. Greater amounts of slash would raise soil temperatures to lethal levels at depths from which redstem seedlings can emerge after germination. Similar effects undoubtedly occur during wildfires.

Germination of Seed on Snow

Conifer seeds germinating on or in snow were first reported years ago, but only recently has the widespread, common occurrence of such germination been observed. During 4 years of incidental observation, germination on snow was noted on 25 separate occasions at widely separated locations in Oregon and Washington. Most of these occurrences were observed in the Cascade Range, but germination on snow was also observed in the Olympic Mountains and Coast Ranges. Germinated seeds of noble and Pacific silver fir were found most frequently; those of grand fir, subalpine fir, Shasta red fir, and mountain hemlock were also found at one or more locations. Germination of scattered individual seeds was most common, but occasionally several germinants were found protruding from a whole or a portion of unshattered cone.

Few seedlings germinating on snow are likely to become established because their shifting support prevents penetration of the radicle into soil. Thus, broadcast seeding on deep snow seems inadvisable. Early development and late persistence of a snowpack might also hinder the establishment of natural regeneration on clearcuts and may help explain the continuance of many natural openings in high-elevation forests.

Noble fir seed germinating in an unshattered cone found lying in a snowbank.

Screening Tests of Picloram on Salmonberry

Salmonberry (*Rubus spectabilis*) is a major problem on forest land in the Pacific Northwest. It quickly occupies sites after logging and after aerial spraying to release conifers from taller brush and weed trees in the Coast Ranges. Amitrole-T is now widely used to control salmonberry, but foresters are seeking more effective chemicals for use on this species.

On July 22, 1966, two formulations of picloram (M-2951 and M-3083) were applied as foliage sprays on salmonberry in the Oregon Coast Ranges. M-2951 contains one-half pound a.e. (acid equivalent) of picloram plus 2 pounds a.e. of 2,4,5-T per gallon; M-3083 contains 1 pound each of picloram, 2,4-D, and 2,4,5-T per gallon in the form of triisopropanolamine salts. Amitrole-T at rates of 1 gallon and 1-1/2 gallons per acre was applied on adjacent plots for comparison. Low volatile esters of 2,4,5-T were also included in the tests. A 2-percent-diesel-oil emulsion was used as the carrier for 2,4,5-T; the other herbicides were applied in water carriers.

Response to treatment was evaluated 15 months later by use of the Dow Rating System based on 10 observations per plot:

Treatment			Degree of control[1]
Herbicide	Rate per acre	Carrier	
Amitrole-T	1 gallon	Water	2.4
Amitrole-T	1½ gallons	Water	2.4
M-2951	1 gallon	Water	2.8
2,4,5-T	3 pounds	Emulsion	3.5
M-3083	1 gallon	Water	3.5
M-3083	1½ gallons	Water	4.1

[1]A rating of 1.0 indicates little or no effect; a rating of 5 indicates complete kill with no resprouting.

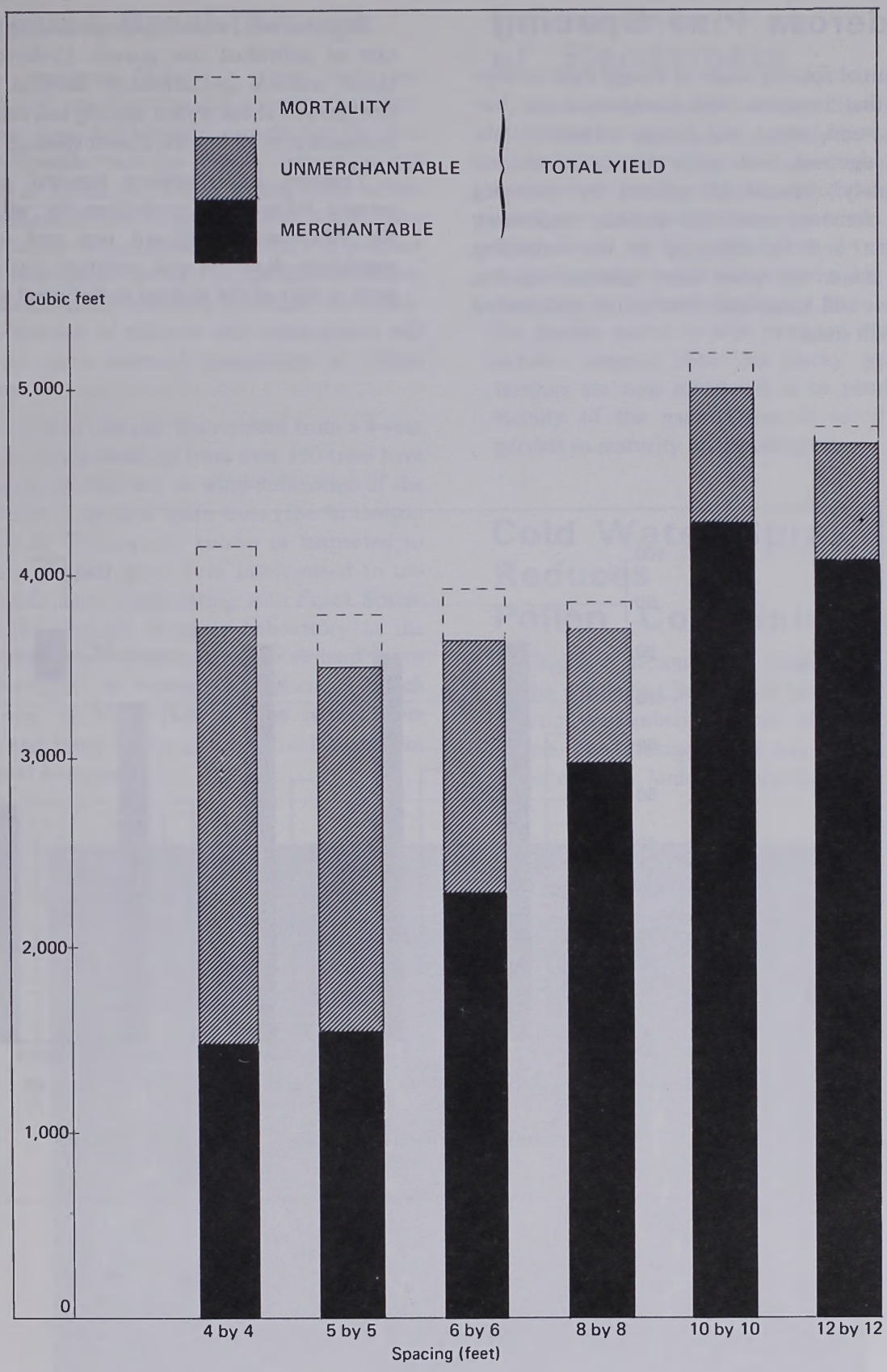
M-3083 at a rate of 1-1/2 gallons per acre provided a noticeably higher percentage of kill than any of the other treatments. This should be a useful treatment for controlling salmonberry in preparing nonstocked sites for reforestation with conifers. Where conifers are present, the nonselective effect of picloram may make it more desirable to use a chemical like 2,4,5-T that is less damaging to the trees. On these plots, 3 pounds a.e. of 2,4,5-T per acre produced a higher percentage of kill than either of the amitrole-T treatments and at far less cost. Neither amitrole-T nor 2,4,5-T damaged small Douglas-firs on the spray plots.

Forty-Year Growth and Yield of Spaced Douglas-Fir

How does spacing affect growth and yield of Douglas-fir? To answer this question, we planted trees on site IV land in 1925 at spacings ranging from 4 by 4 through 12 by 12 feet. Since age 23, growth has been greater on wider spacings and differences are increasing with time. Growth per acre during the past 5 years was 940 cubic feet on the 12 by 12 spacing, compared to 435 on the 4 by 4 spacing. Consequently, within the range studied, current yield now increases as spacing increases. For example, the 12 by 12 spacing now has 28 percent more total volume and over 2.5 times as much currently usable volume (volume to a 4-inch top in trees 5.6 inches d.b.h. and larger) as the 4 by 4 spacing. Furthermore, trees on the wide spacings are of a quality equal to or better than those on close spacings.

Growth of even the largest trees is clearly increased by wide spacing. The 100 largest (d.b.h.) trees per acre are currently 67 percent larger in diameter (12.1 versus 7.3 inches) and 39 percent taller (79 versus 57 feet) on the 12- by 12-foot than on the 4- by 4-foot spacing. The differences are also increasing with time.

Even with wide spacings, however, growth of individual dominant trees has slowed down markedly. For maintenance of desirable diameter growth rates, these stands should have been thinned at about age 30. The 10 by 10 and 12 by 12 spacings could have supported such thinnings at this age, and the 8 by 8 spacing could support a commercial thinning now (age 43). The closer spacings, however, even now would not support commercial thinnings by current minimum merchantability standards.



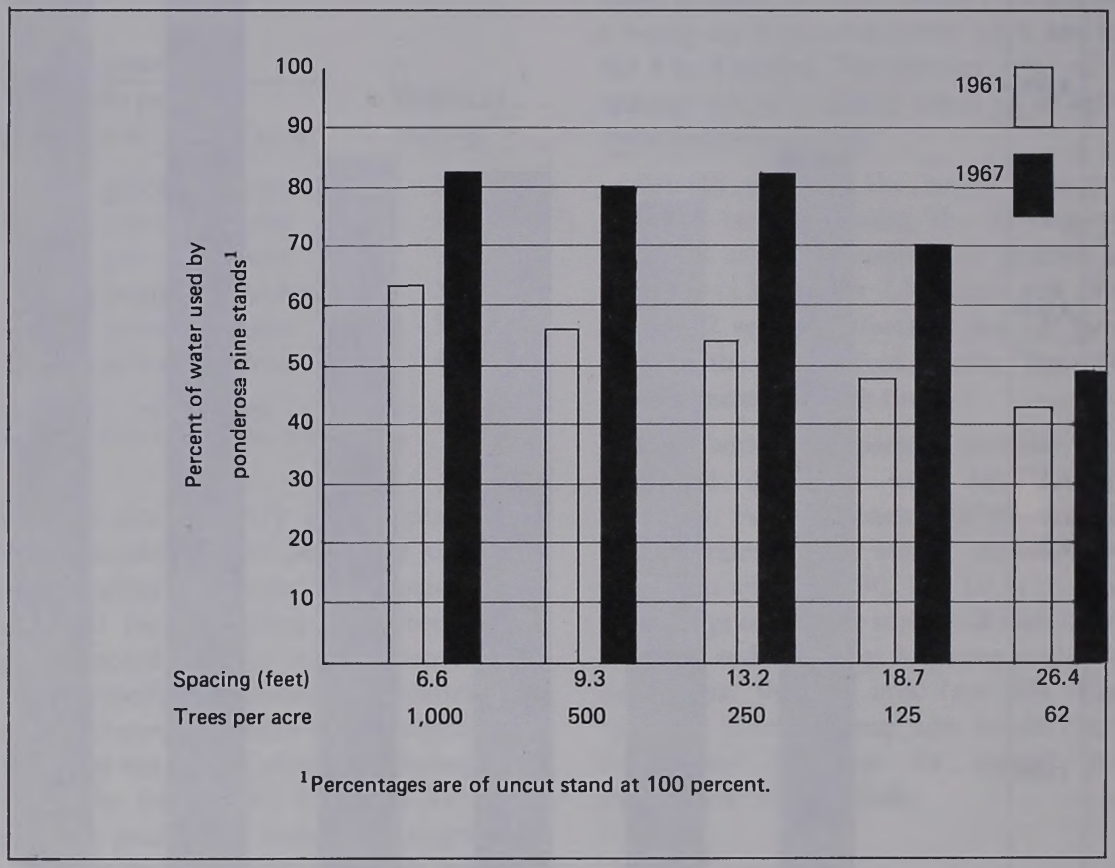
Effect of spacing on total and merchantable cubic volume yield at age 43 (Wind River).

Ponderosa Pine Spacing

An initial spacing study at Pringle Falls demonstrated that intensive land management can harmonize wood, water, and forage outputs in relation to demand. Soil water use by plants was immediately reduced 50 percent by removing mature overstory trees and shrubby understory vegetation and by thinning in the remaining sapling stand. Six years later, substantially less water was still being used than in the undisturbed old-growth stand.

Progressively wider spacing steadily increased rate of individual tree growth. Understory vegetation removal approximately doubled individual tree growth at the widest spacing and substantially increased it at all but the closest spacing.

Thinning and overstory removal greatly increased bitterbrush production for wildlife, but the subsequent combined tree and understory vegetation drain on soil moisture was almost as great as that of the original undisturbed stand.



[1] Percentages are of uncut stand at 100 percent.

Genetics Breakthrough

Two unrelated Douglas-fir trees, one near Lacomb and one near Corvallis, Oregon, that carry the same gene for albinism provide for the first time a valuable tool for directly estimating the amount of pollen exchanged among trees within seed orchards. Scions from these trees, grafted into seed orchards in particular patterns, will produce albino seedlings in the ratio of one albino to three green seedlings anytime they pollinate one another. The amount of dilution with other pollen will show up in a lowered proportion of albino seedlings.

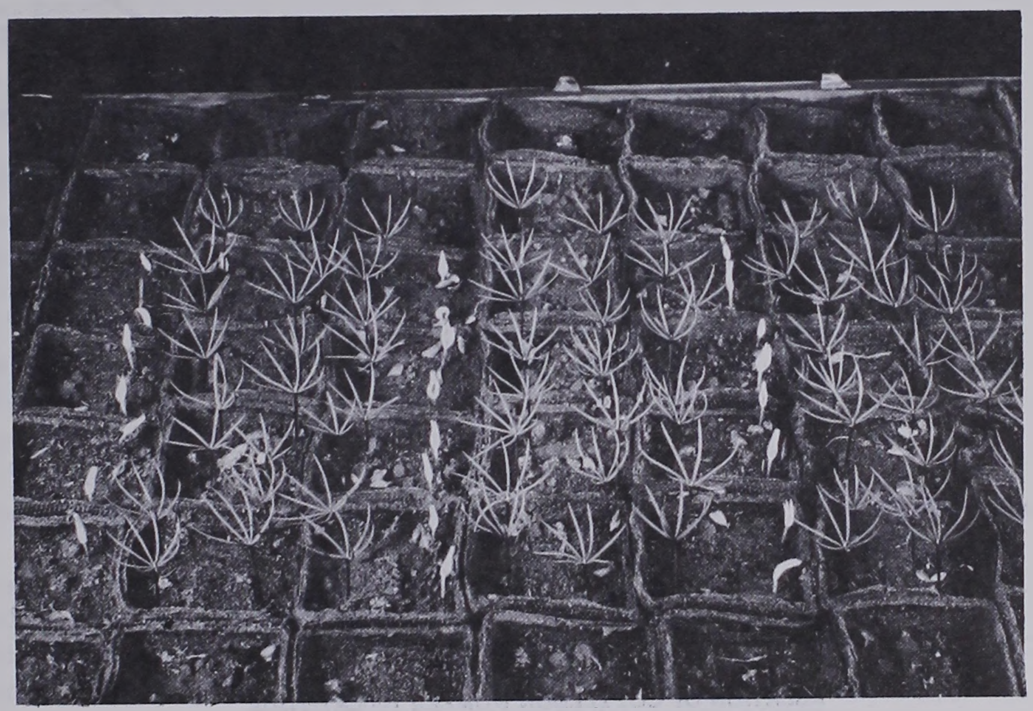
Discovery of this pair has resulted from a 4-year search in which seedlings from over 150 trees have been screened after self- or wind-pollination of the parent trees. Last year seven trees (five in Oregon and two in Washington) known or suspected to carry an albinism gene were intercrossed to uncover these trees. Cooperating with Frank Sorensen of the Forestry Sciences Laboratory in the search and cross-pollinations were Reinhard Stettler (University of Washington), Richard Piesch (University of Washington at time crosses were made), and Boyd Wilson (Washington Department of Natural Resources).

Inheritance of Slenderness

Some of the control over tree diameter usually attributed to spacing may actually be of a genetic nature. To study this, we crossed seven pairs of open-grown ponderosa pine, one slender and one stocky in each pair, in various combinations in 1964. Under the same conditions, 3-year-old seedlings of average height vary considerably in average diameter on a family-by-family basis. Generally, the slender parent in each pair gave slightly more slender progeny than the stocky parent. The families are now scheduled to be planted in the vicinity of the parent trees to see if the trait persists to maturity of the offsprings.

Cold Water Spray Reduces Pollen Contamination

Region 6 personnel are cooperating in a study of the perplexing problem of how to minimize the genetic contamination from outside sources of pollen. The stratagem used was to arrest development of cone buds by spraying them with very

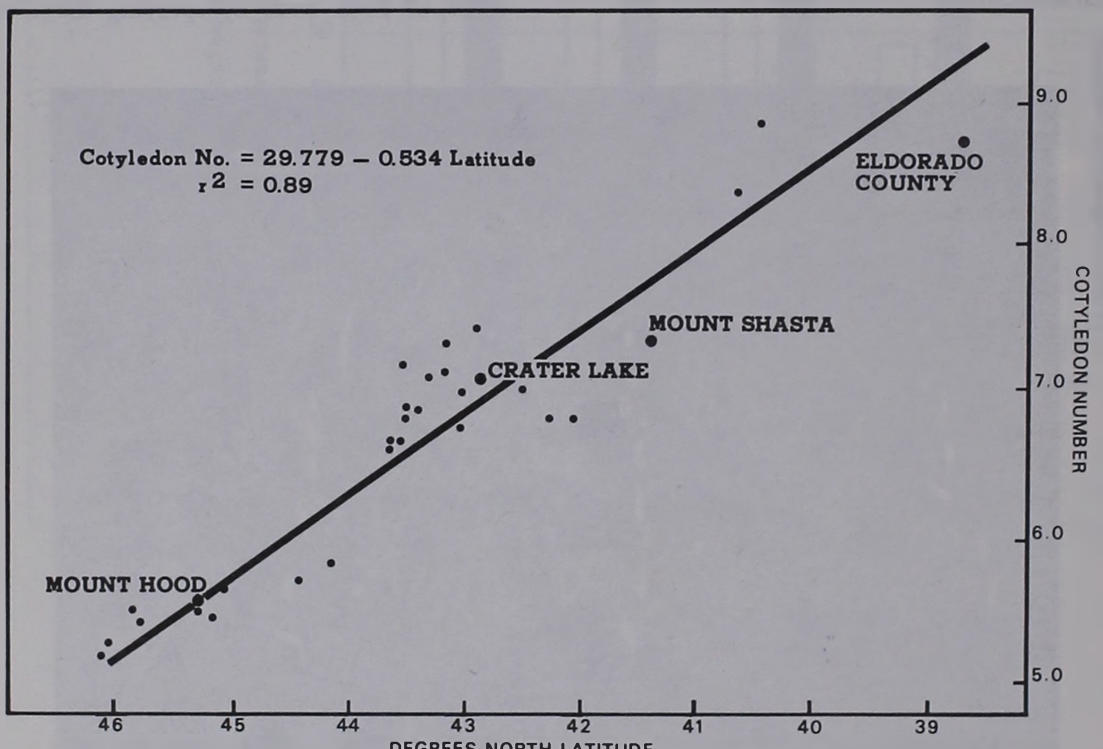


Major scientific advance in Douglas-fir genetics is highlighted by this seedling demonstration of an albino mutant in the three-to-one ratio. Seedlings come from crossing two large trees recently discovered to have the same recessive gene. The discovery provides the tool to estimate pollen contamination of seed orchards and a first start to chromosome mapping of forest trees.

cold water from a snow-fed stream. It was hoped that the seed orchard floral buds would be inhibited inside their bud scales long enough for the local trees to complete pollen shedding. Then, after the spray is discontinued, floral buds in the orchard could develop and interpollinate in relative freedom from contamination. In a study in which overhead-type sprinklers were used, floral buds of Douglas-firs were held back an estimated 12 days, enough to reduce contamination below 100 grains per cone. This is an acceptable contamination. Pollen counts were in the 1,000-3,000 range in the unsprayed part of the orchard. The modest success and lack of damage by contamination now encourages larger scale trials of this approach.

Verification of Noble and Shasta Red Fir Seed Source

Verification of seed source – a long-standing problem in forestry practice – is well on its way to solution for noble and Shasta red firs. First-year results of a study relating seed and seedling characteristics to latitude revealed a significant increase in cotyledon number from north to south. Average cotyledon number for the most northern population (Stevens Pass, Wash.) was 4.9; average cotyledon number in southern Oregon was between 6.7 and 7.4. The regression of cotyledon number on latitude for the 1967 collections was highly significant, explaining all but 11 percent of the variation. Seed weight varied in a similar pattern with lightest seed in the north and heaviest in the south. Source of a given seed lot can be checked by taking a representative sample of about 100 seeds, obtaining average cotyledon number by examination of the embryo with a hand lens, or by germinating the seed and comparing the average cotyledon number of the sample with an average obtained for the seed source in question. Analysis of additional seed collected in 1968 is expected to better define relationships involved.

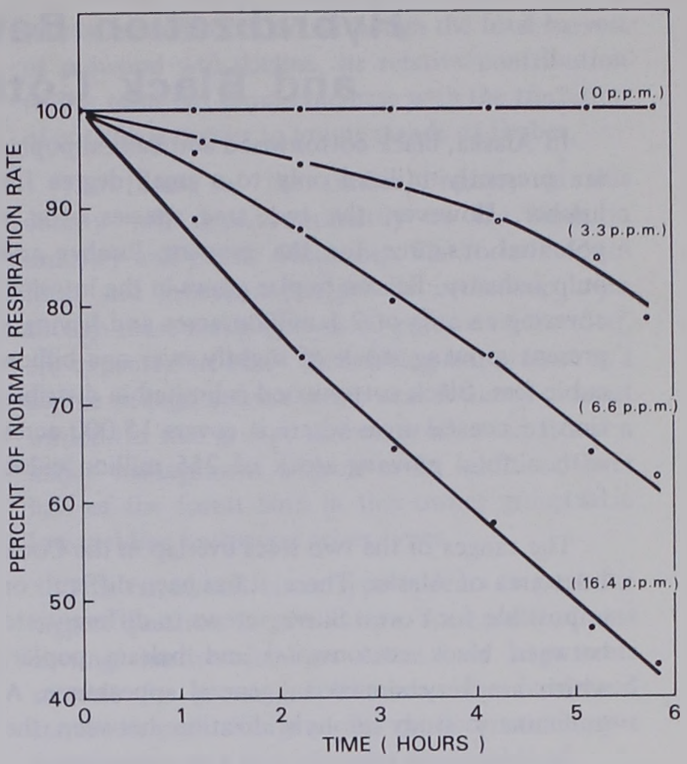


RELATION OF COTYLEDON NUMBER TO LATITUDE, PRELIMINARY DATA FROM 1967 COLLECTIONS

Nursery Stock Packing

Shingle tow, the stringy byproduct from the manufacture of western redcedar shingles, was first used about 1915 to keep tree seedling roots moist during shipment. Shingle tow has become the packing material most commonly used in Pacific Northwest forest nurseries. It has not been without critics, however.

Results of recent investigations partially clarify the role of shingle tow as a packing material. Chemical compounds found in cedar wood, particularly thujaplicins, can depress root respiration or kill seedlings, and concentrations of thujaplicins up to 120 p.p.m. have been found in nursery samples of tow. However, soil on seedling roots can adsorb thujaplicins and moderate their influence. Several other factors also affect availability of the toxic chemicals present, their uptake by seedling roots, and the subsequent net effect of packing seedlings in shingle tow. Acting on this information, some nurserymen have chosen to use alternate packing materials and others to leach shingle tow more thoroughly before use.



Solutions of γ-thujaplicin depress respiration of Douglas-fir root tips in M/45 citrate buffer, pH 5.0 at 30° C.

Alaska-Cedar

Alaska-cedar is a relatively little known but valuable timber species in the Pacific Northwest. It is in demand for domestic specialty items and has long enjoyed a demand in the Orient. Recent public hearings on log export policy have focused attention on the species. Production has been small and erratic in the past but is increasing as logging technology and changed economic situations bring more remote and formerly inaccessible stands into production. The total net sawtimber supply in the United States has been estimated to be approximately 5 billion board feet, most of which is in Alaska.

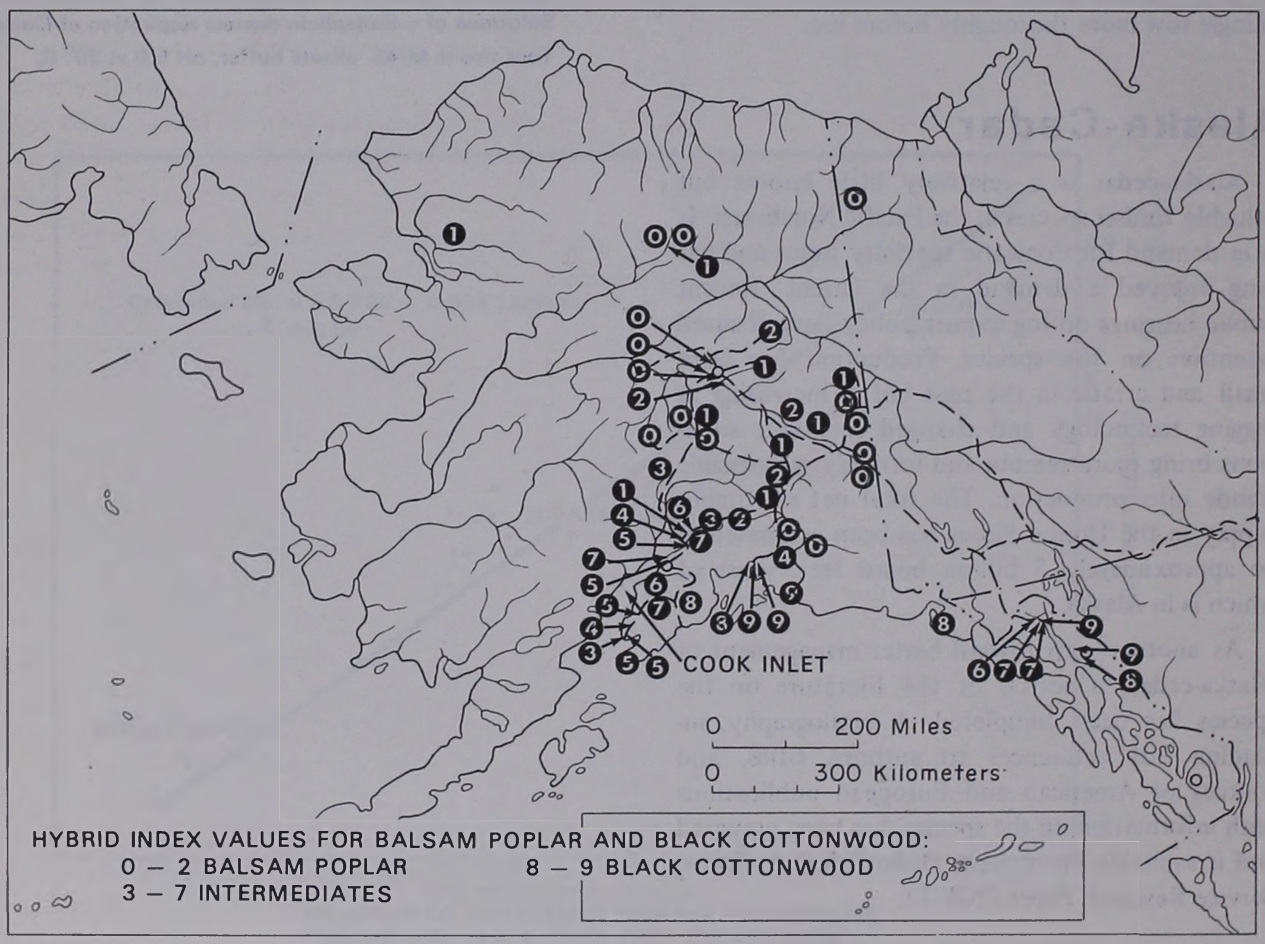
As another step toward better management of Alaska-cedar, a search of the literature on the species has been completed. A bibliography, including 301 references to authors, titles, and sources of American and European publications with information on the species, has been prepared and is available on request. Order U.S.D.A. Forest Service Research Paper PNW-73.

Hybridization Between Balsam Poplar and Black Cottonwood in Alaska

In Alaska, black cottonwood and balsam poplar are presently utilized only to a small degree for lumber. However, the two tree species offer a potential resource for the growing lumber and pulp industry. Balsam poplar grows in the interior, covering an area of 2.1 million acres and having a present growing stock of slightly over one billion cubic feet. Black cottonwood is limited in distribution to coastal areas where it covers 15,000 acres with a total growing stock of 255 million cubic feet.

The ranges of the two trees overlap in the Cook Inlet area of Alaska. There, it has been difficult or impossible for Forest Survey crews to differentiate between black cottonwood and balsam poplar, which are very similar in general appearance. A preliminary study of hybridization between the two trees indicates that, in the zone where the two ranges overlap, there is extensive hybridization and this was reflected in most of the trees encountered by the intermediate flower characteristics. Extensive hybridization between the two species has also been shown in large areas in adjacent Canada.

A hybrid index of 0 to 9 was designed for the Alaska study. A score of 0 to 2 indicated pure balsam poplar; 8 to 9, black cottonwood. The map shows the hybrid clones for Alaska and illustrates that there is a wide area of hybridization in the Cook Inlet area from the southern Kenai Peninsula to the south slope of the Alaska Range. There has also been some hybridization through the low mountain passes across the Coast Range at Haines and at Valdez.


COOK INLET
0 200 Miles
0 300 Kilometers
HYBRID INDEX VALUES FOR BALSAM POPLAR AND BLACK COTTONWOOD:
0 – 2 BALSAM POPLAR
3 – 7 INTERMEDIATES
8 – 9 BLACK COTTONWOOD

Timber Measurement

New taper and volume tables have been developed for red alder. Average shape of red alder trees was described by an equation which provided estimates of inside bark diameter at any point on the stem of trees of given d.b.h. and total height. A system of tables and equations based on this taper equation provided estimates of (1) total cubic-foot volume and merchantable volumes in cubic feet and in board feet for alternative utilization limits, (2) scaling practices, and (3) size classes of material. The system provides a previously lacking flexibility and consistency in estimates for different units and utilization standards and is well suited to use with automatic computing equipment. Similar procedures should be applicable to other species.

Forest Survey in Washington

Fieldwork for timber resource inventories was completed in the eastern portion of Washington this year, thus completing coverage for the entire State since 1963. These inventories will provide the basis for a reevaluation of the timber resource picture for the entire State, as well as for the eastern and western portions separately.

Forest Survey in California

Fieldwork for a reinventory of the timber resources of Siskiyou County, California, was also completed. Data from this inventory will provide the basis for a detailed analysis of the timber resources of Siskiyou County.

Coast redwood currently accounts for about one-third of the Humboldt County annual cut; Douglas-fir, most of the other two-thirds. However, redwood occupies the most highly productive forest areas in the county, primarily on forest industry lands managed for timber production. Redwood currently accounts for almost half of the softwood sawtimber growth. And since a century of cutting was concentrated in the redwood type, many of the mature young softwood sawtimber stands are redwood. So, although the total harvest of redwood will decline, its relative contribution to the total cut should increase with the transition of cutting activities to young stands of timber.

The future of the timber industry in this county will depend primarily on the lands in industry and public ownership. The forest lands in farm and miscellaneous private ownership, even though these make up over 40 percent of the total, are expected to be of diminishing importance as a source of logs, at least in the near future. For most owners in this group, timber production is not a major management objective. In addition, over half of the forest land in this owner group is in low-yielding hardwood cover types.

This hardwood cover type appears to pose the biggest question for the future. As a result of past cutting, hardwoods have taken over large areas suitable for growing softwoods. The hardwood stands on such sites generally produce much lower volumes per acre than the sites are capable of.

Production Economics

The Douglas-fir region (west of the Cascade Range in Washington, Oregon, and northern California) is notable as a major supplier of the Nation's timber product requirements. Timber dependent industries account for a major share of the region's manufacturing employment. However, some communities are more dependent upon timber production than others. Douglas County, in southern Oregon, is very dependent upon timber production. In 1960 for example, 99.4 percent of its basic (i.e., producing for markets outside the county) employment was timber dependent. At the other extreme, a three-county area – Island, King, and Snohomish – centered in Seattle, Washington, had only 6.2 percent of its basic employment dependent upon the timber industry.

An economic analysis of public forest investment opportunities in the Douglas-fir region disclosed a wide variation in returns on investment between working circles. Generally speaking, the greatest economic gains would come in Oregon. Interestingly enough, data suggest that areas where nontimber values, i.e., recreation, water, esthetics, etc., are the greatest would not earn very high returns on investments in timber production.

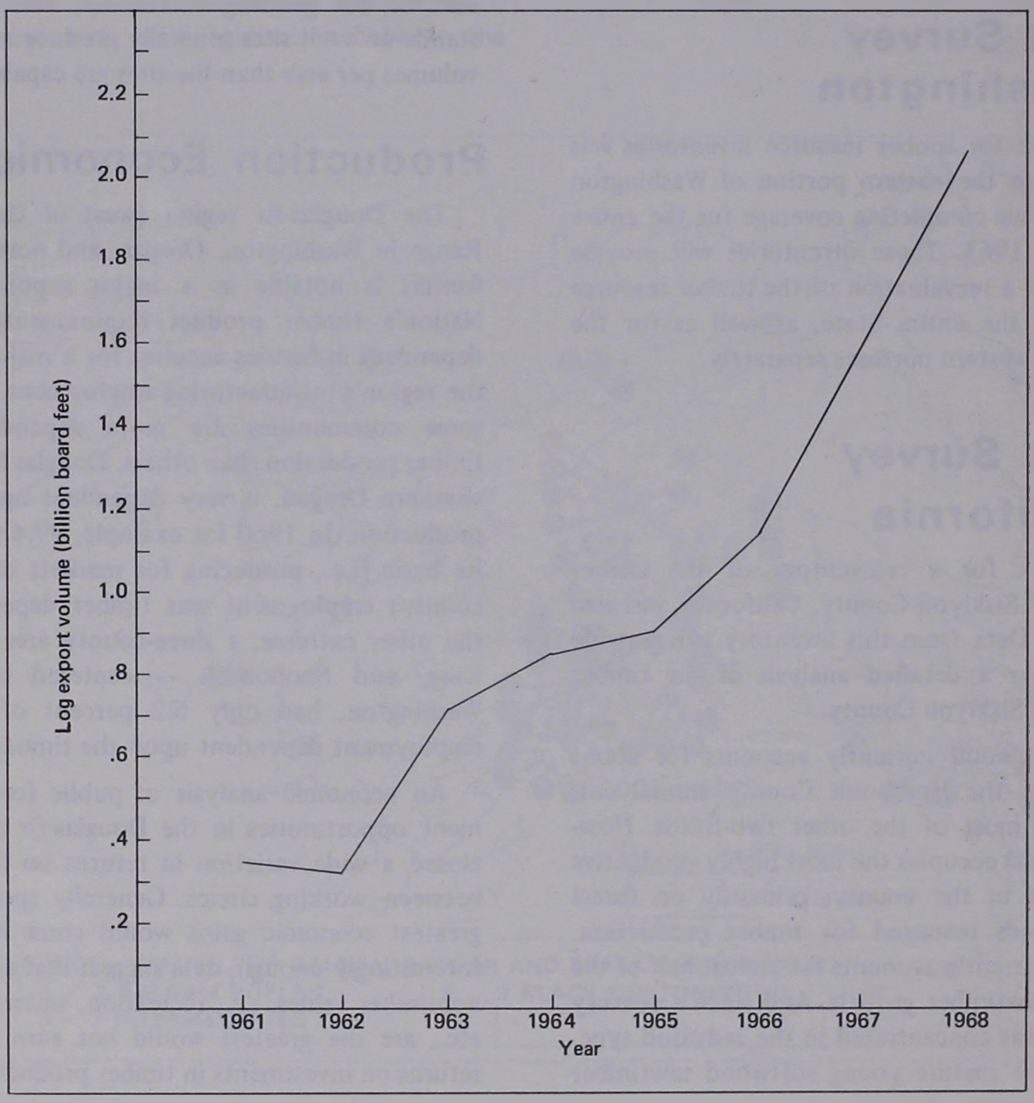
A computer program has been developed for calculating allowable cut by use of either area or volume regulation for a perpetual series of planning periods. This program, known as SORAC, enables the timber management analyst to introduce growth and yield expectations for every planning period. Though this computer program was designed for analyzing National Forest management alternatives, it is applicable to any forest resource management situation.

Timber Sale Competition

A study of Forest Service and Bureau of Land Management timber sales in Oregon and Washington showed that certain buyer, sale, and market characteristics had an important effect on competition for Federal timber. Competition, defined as the ratio between bid price and appraised price, was significantly affected by number of bidders, size of purchaser (large firm or small), sale size, road construction requirements, and the appraised price. Lumber prices and the level of housing starts were also found to be important in explaining the size of the bid-appraisal ratio.

Log Exports

Log exports from Oregon and Washington reached a new high in 1968; the export volume of 2.0 billion board feet was up 25.6 percent from 1967. The average value of 1968 log exports was $102.37 per thousand board feet as compared with $88.91 in 1967.



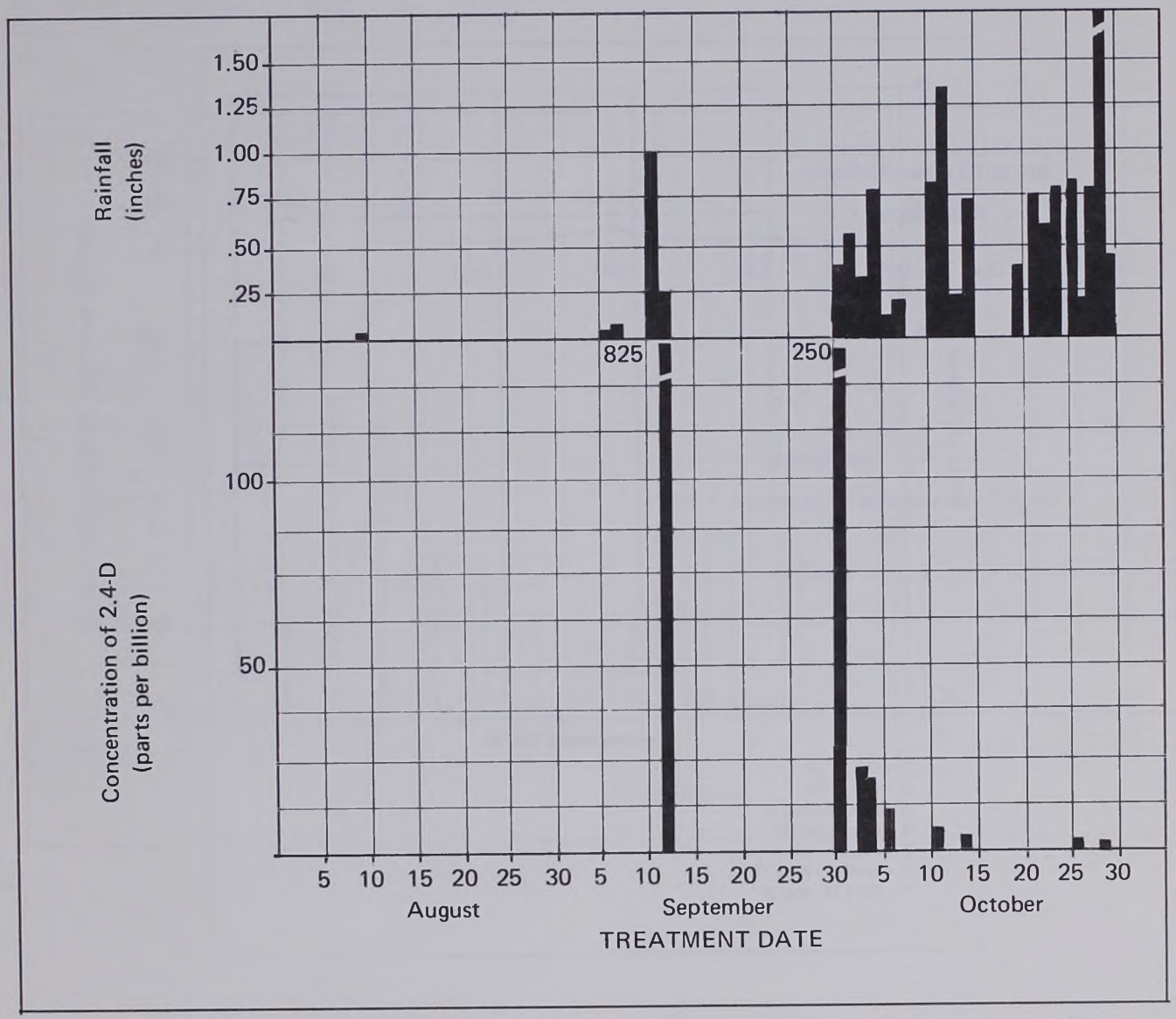
Herbicide Runoff After First Fall Rains

One of the chief concerns of use of pesticides in the forest is water pollution. Chemicals are rarely intentionally applied to forest waters, but movement of chemicals from the soil surface to watercourses is one accidental and potential source of pesticide residues in water systems.

We studied a small watershed on which woody vegetation had been controlled with 2,4-D in August. Little rain fell between the time of treatment and September 11-12 when 1.3 inches of precipitation was recorded.

We found appreciable quantities of 2,4-D in the surface runoff from this intense first fall storm. By the end of October, however, the level of 2,4-D in runoff water from subsequent storms had dropped below the limits of detection.

This study indicated that appreciable herbicide runoff may result if the first storm occurring after the chemical is applied is sufficiently intense to cause surface runoff rather than slow infiltration of water. The concentration of herbicide in the runoff decreased rapidly, however, so stream contamination with 2,4-D was of short duration.

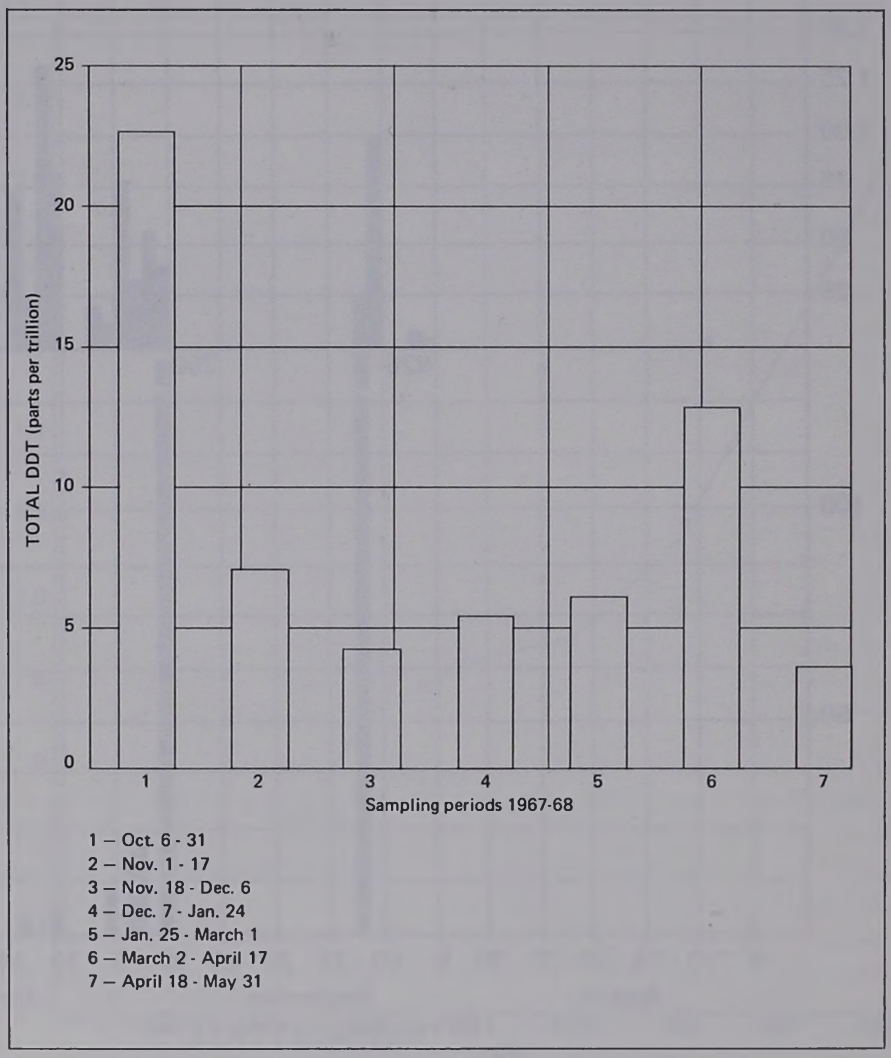


DDT in Pacific Northwest Precipitation

Persistent pesticides have been found in the atmosphere of England and eastern United States and in a variety of organisms worldwide. We also find a low-level background of such chemicals in many parts of the forest environment of the Pacific Northwest, including areas that have never received insecticide applications. Pesticide-containing dust and rainwater are the most likely agents by which chemicals can be transported far from their point of original application.

At the Station's H. J. Andrews Experimental Forest in the Oregon Cascades during fall 1967 and winter and spring 1968, DDT was present in precipitation in low concentrations but in sufficient amount to account for a substantial part of the DDT background frequently observed. The highest concentration was in the first fall rains which wash the air of much particulate matter accumulated in the atmosphere over the low-rainfall summer months.

This information adds to our knowledge of atmospheric pollution and provides a basis for assessing net amounts of DDT remaining in the forest environment after operational use against insect pests.

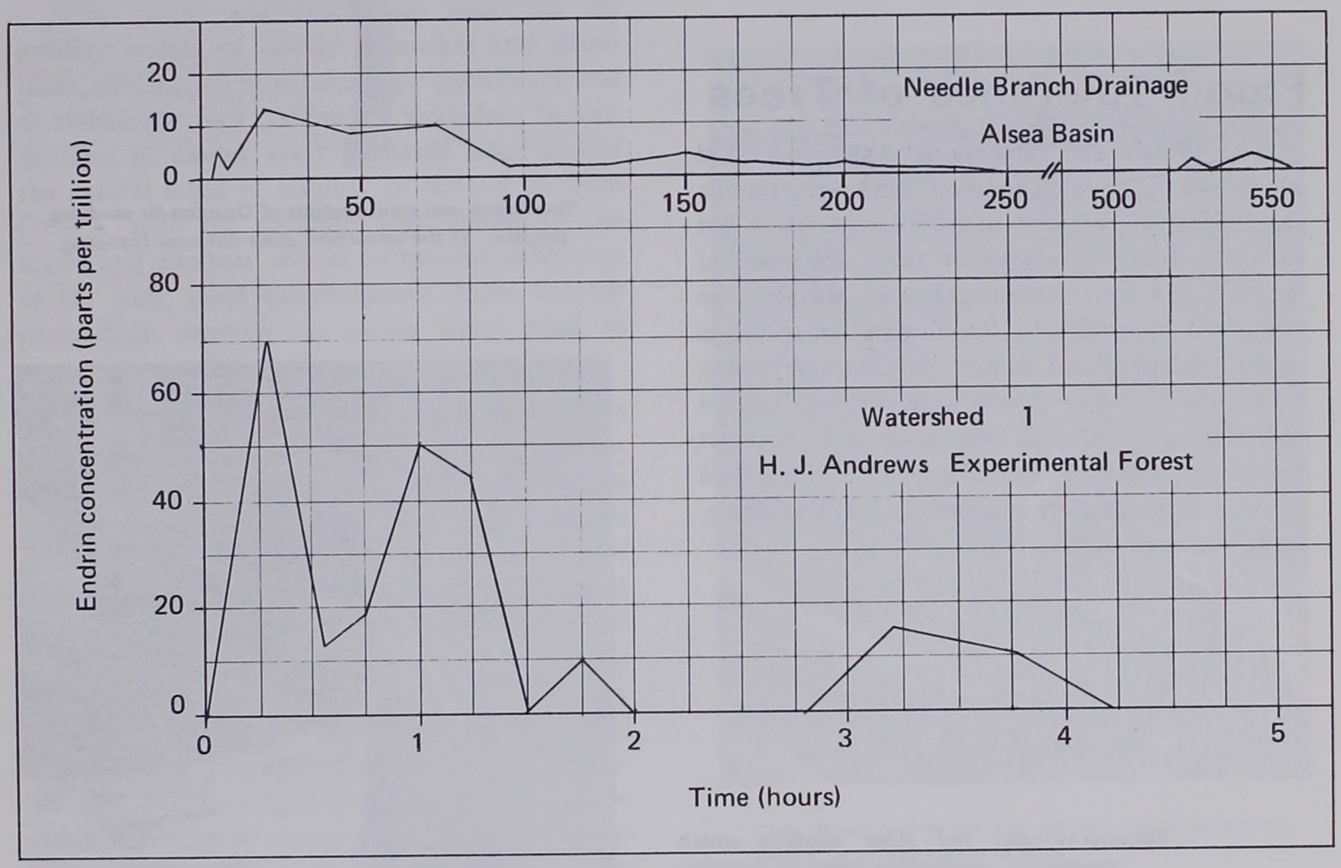


Endrin-Treated Seed and Water Quality

Endrin, a chlorinated hydrocarbon insecticide, is widely used to protect aerially applied conifer seed from rodents. The total amount of endrin thus introduced into the forest environment is not great, but we know little about its possible effects on nontarget organisms. We do know, from laboratory studies reported by others, that certain dosages of endrin can be toxic to fish.

In a preliminary appraisal of side effects from the use of endrin-treated conifer seed, we collected and analyzed streamwater samples from two western Oregon watersheds after aerial seeding. Both watersheds are about the same size, and stream channel lengths covered by the seeding are essentially alike. However, runoff characteristics differ greatly between the two streams, as indicated by maximum endrin concentrations measured and the length of time over which endrin could be detected in the water.

In the two situations studied, the maximum endrin concentration found was only 70 parts per trillion. However, detectable residues were found in one stream up to 3 weeks after the seeding, indicating possible prolonged exposure of fish to the chemical and potential buildup of endrin in aquatic food chains. This investigation will be continued and enlarged.



Streamside Shade Moderates Water Temperature

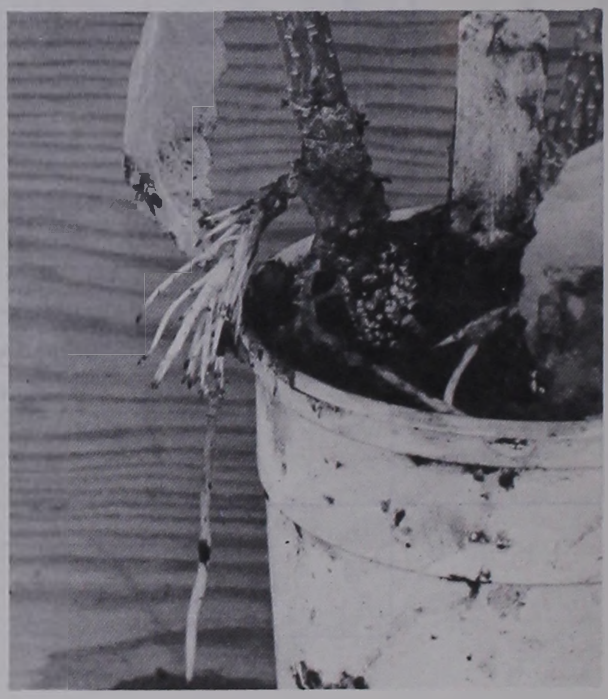
The chief cause of high stream temperatures in western Oregon is exposure of the surface to direct solar radiation. Where streamside vegetation provides shade, net solar radiation on sunny days may be only one-third of that reaching open stretches. Instantaneous maximum summer water temperatures in shaded stretches of small streams in forested areas have been found to be 14° to 28°F. lower than in exposed stretches; and during July, August, and September, they commonly average 12° to 14°F. lower. Since the forest manager can control removal of streamside vegetation by location of clearing and clearcut logging patches, he can help maintain a favorable stream habitat for cool water fishes such as our highly prized salmon, steelhead, and trout.

Flood Tolerance of Trees

The timber and recreational values of flood plains, swamps, and reservoir shorelines can be maximized by growing flood-tolerant trees; but little has been known about flood tolerance of northwestern trees. Tolerances of six species were compared by artificially flooding potted seedlings in both summer and winter. Survival and growth differences between species were evident. Western redcedar and lodgepole pine seemed to be most tolerant of flooding. Red alder, Sitka spruce, and western hemlock were moderately tolerant. Douglas-fir was intolerant.

Douglas-fir seedlings appeared to be girdled by summer flooding – roots died while shoots were still green, and stems became swollen at the waterline. In contrast, many summer-flooded alder seedlings developed adventitious roots at the waterline.

Dead root and stem section of Douglas-fir seedling, swollen at the waterline, after summer flooding.



Summer-flooded red alder seedling which developed adventitious roots at waterline.

Mass Wasting in Southeast Alaska

Soil mass movements constitute the dominant process of natural erosion and slope reduction in geologically youthful southeast Alaska. The majority of these soil mass movements occur as debris avalanches or debris flows involving rapid downslope movement of a mixture of soil, rock, and forest litter of varying water content.

The most common debris avalanche and flow situations develop on greater than 30° slopes in either (1) shallow soils derived from colluvium or bedrock, with bedrock serving as the sliding surface, or (2) shallow soils derived from glacial till with impermeable, unweathered till serving as the sliding surface. Both soil groups are coarse and permeable with less than 20 percent of the particles finer than silt.

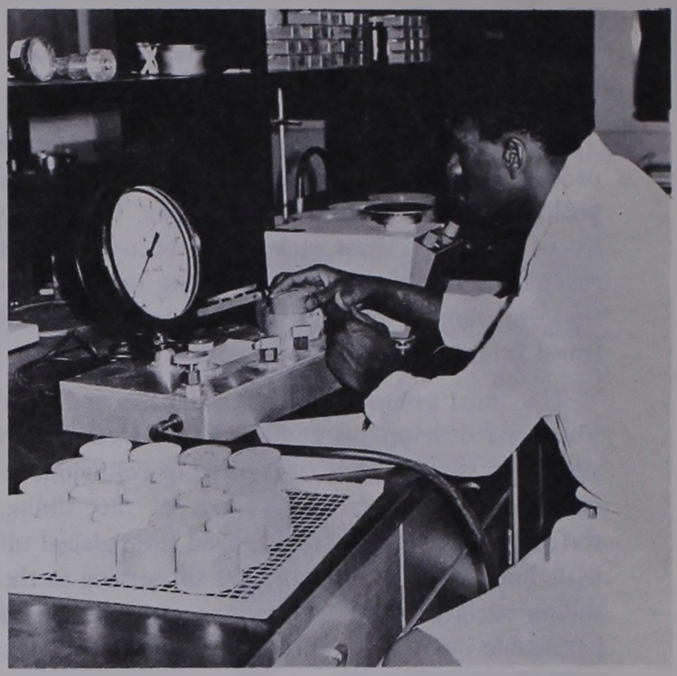
Steep slopes and excess soil water are the primary causes of debris avalanches and debris flows; destruction of natural slope equilibrium and of stablilizing root systems are secondary factors. Sections of almost every timbered slope exceed the natural angle of stability of the soil on them (>30°). With the naturally high rainfall of the region and resultant, almost continuous, saturation of the soils, these oversteepened slopes become particularly sensitive to events which tend to disrupt their stability.

The practical problem faced by land managers is to control the effects of man's activities so that mass movement occurrences are minimal. This may be done by (1) application of direct methods of slope stabilization or (2) avoidance of areas of known or expected instability. Probably the most practical and least expensive management method at the present time is avoidance of slide-susceptible areas. The internal friction angles for soils commonly found on these slopes is between 30 and 37°. Slopes with gradients equal to or greater than 30° can thus be considered highly susceptible to sliding, particularly if they are disturbed. With this information, we can identify and more effectively manage areas of maximum instability.

Slide developed in bedrock-derived soil, Marten Creek, Bradfield Canal, Alaska.

Slide developed in till-derived soil, Maybeso Valley, Prince of Wales Island, Alaska.

An Air Pycnometer for Soil Porosity



To the watershed manager, porosity, or air space volume, of a soil is one of its most important physical features. It is the portion of a soil volume that is alternately occupied by air and water and is inseparably linked to the capability of a soil to receive, transmit, and store water.

An air pycnometer was developed for the above special application to forest and range soil problems. With this instrument which utilizes undisturbed 100-cc. sample cores, we can rapidly and precisely determine total pore space, pore size distribution, and bulk density for every soil sample.

Other scientists are already patterning instruments after this model to apply to their particular management and research problems.

Behavior Problems in Public Campgrounds

Preliminary findings from a study of depreciative behavior (vandalism, littering, theft, rule violations) in developed campgrounds suggest that theft is far more prevalent than generally supposed and frequently goes unreported to park rangers. Blame for vandalism is shared by a wide segment of the camping public, including poorly supervised children engaging in destructive play and unthinking adults, in addition to teenagers to whom most damage is attributed. Rule violations are extremely common. Many violators do not understand reasons for restrictions and knowingly violate rules blocking them from their objectives. All segments of the camping public share the blame for littering, but the tendency to litter seemed to increase as camper involvement with the area decreased such as just prior to departure. This study will be continued for 2 more years to further identify depreciative behavior problems and techniques for their control.

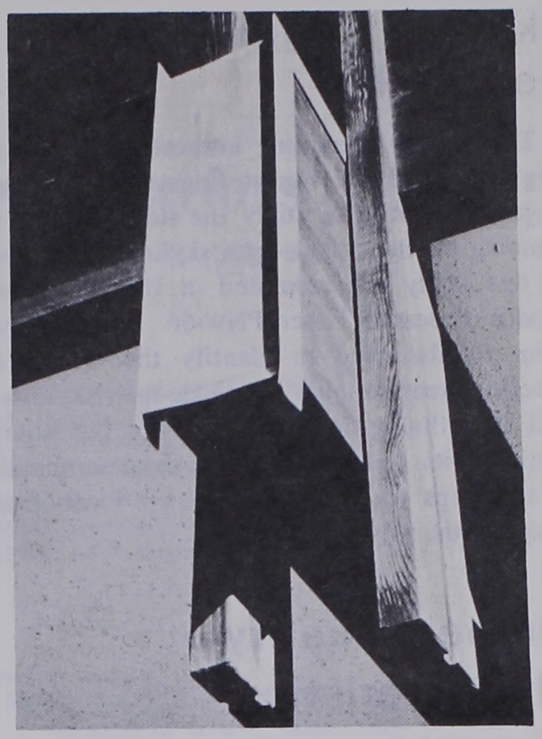
Performance of Wood in Buildings

Station studies on wood performance include:

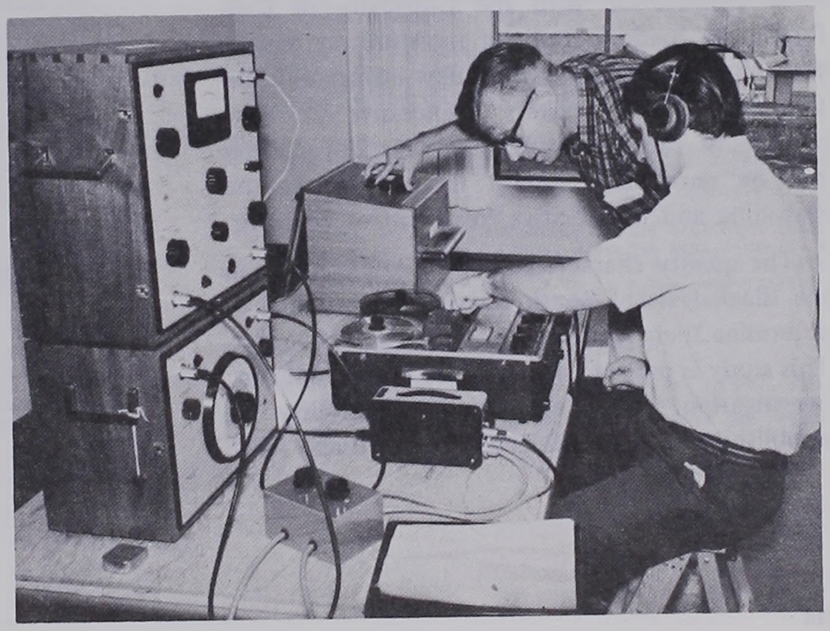
1. The influence of design on the performance of exposed wood, in which 175 buildings in the Puget Sound area were inspected and 27 of these selected for analysis. The importance of overhangs, building orientation, shielding, flashings, treatments, and coatings were examined in detail as factors which may be controlled by design. Special attention was given to column and arch bases and connections which avoid entrapment of moisture. A recent Station publication, "The Influence of Design on Exposed Wood in Buildings of the Puget Sound Area," is a report of the study and available on request.

2. Moisture content of glulam timbers in use, a regional phase of a national Forest Service survey to determine the actual moisture contents of heavy structural timbers under a variety of use environments. These include special exposures such as enclosed swimming pools, ice skating rinks, cold storage rooms, and others found in contemporary buildings. No reliable data existed on this subject, though moisture content has important effects on strength, durability, dimensional stability, and appearance. An initial report covering procedures and findings in the Pacific Northwest during the first 2 years is available under the title, "Moisture Content of Glulam Timbers in Use in the Pacific Northwest."

3. Sound insulation of wood-framed walls and floors in apartment buildings, in which field measurements were taken in new, low-rise apartments to compare the acoustical privacy obtained in actual construction with the potential indicated by laboratory tests. Low-rise apartments are of growing importance in meeting the Nation's critical housing needs, but the attainment of economical acoustical privacy in these units demands technical skill and careful workmanship. Initial tests on 10 walls and six floors indicate that wood-framed construction can meet the requirements.



Metal flashing protection at end-grain surface.



Noise levels on both sides of apartment walls are recorded in the field and analyzed later to determine the acoustical privacy provided.

Skyline Engineering Research

The rapidly increasing interest in skyline logging prompted the Forest Engineering Research Project in Seattle to study the steps required for planning efficient single-span skylines. The results of this study are presented in U.S.D.A. Forest Service Research Paper PNW-66. Attention was given to the need to identify the criteria for selecting areas suitable for single-span skylines as well as outlining the means of laying out suitable cutting units. Included also was the determination of the steps to be taken in onsite location and design of the skyline.

Timber Quality Characteristics

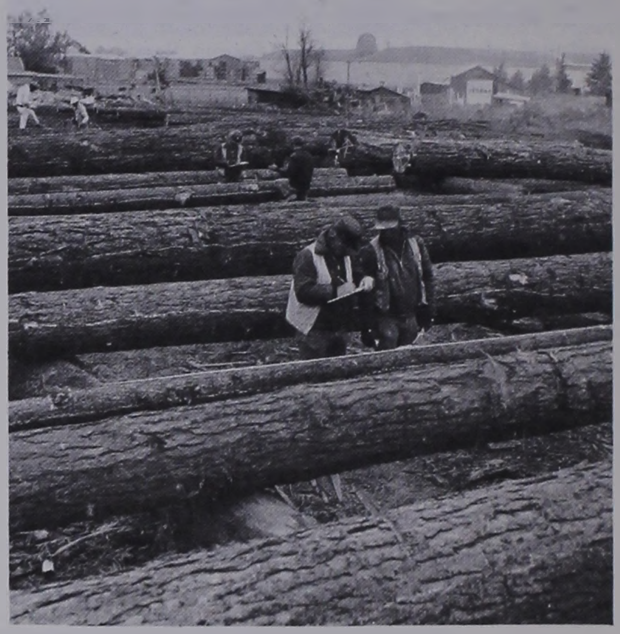
Research is being conducted to help us develop more accurate grading systems for estimating the end product value of standing timber. Grading systems are developed from study of the relationship of various log and tree characteristics to the yield of lumber, veneer, and other products. Timber quality studies are being carried out for most of the important western softwood species.

Spiral or twisted grain is a timber characteristic that has a significant effect on the value of lumber and veneer. Spiral grain patterns were studied in an extensive sample of coast Douglas-fir trees. The results show a need to revise the present log grading systems that use spirality as a grading criterion.

In cooperation with the University of California, we made a study of moisture content in white fir. The results provide new information on the occurrence of pockets of excessive moisture, commonly called "wetwood." This information will be particularly useful to industry in the seasoning and preservative treatment of white fir.

The quality characteristics of ponderosa pine in the Black Hills of South Dakota were studied to determine their relationship to the yield of veneer. This study is part of a joint Forest Service-industry investigation to determine the feasibility of establishing a plywood plant in the Black Hills. The results showed the effect of tree size and knot patterns on the yield of various grades of veneer.

Douglas-fir logs that are excessively knotty or limby were studied to determine the effect of these characteristics on log scaling and the yield of lumber. The study indicated that log scalers were often making excessive deductions for log "roughness." The study contributed to a significant change of the log scaling and grading rules used in the Douglas-fir region which improved and clarified the "rough-cut" deduction. Details are available in Research Note PNW-73.



ANNOTATED LIST OF PUBLICATIONS

1968

THIS IS A LIST OF ALL PUBLICATIONS BY STATION STAFF AND COOPERATORS DURING THE YEAR 1968, INCLUDING PUBLISHED TALKS AND ADDRESSES (FEDERAL, STATE, OR PRIVATE COOPERATORS ARE INDICATED BY AN ASTERISK). AVAILABLE PUBLICATIONS MAY BE ORDERED BY THE FIVE-DIGIT NUMBER AT THE END OF AUTHOR LINE FROM PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION, P.O. BOX 3141, PORTLAND, OREGON 97208.

ADAMS, THOMAS C. 1 68006
PRICE TRENDS OF OPEN-MARKET DOUGLAS-FIR LOGS IN WESTERN WASHINGTON AND NORTHWEST OREGON.
U.S. FOREST SERV. RES. NOTE PNW-74, 6 PP., ILLUS.
DATA ARE PRESENTED BY LOG GRADE FOR THE YEARS 1936-66 AND INCLUDE A SEPARATE SERIES FOR EXPORT LOGS IN THE LAST 4 YEARS.

AUSTIN, JOHN W. 8 68081
PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN NORTHWEST FOREST INDUSTRIES, SECOND QUARTER 1968.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 27 PP., ILLUS.
PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUSTRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES, AND OTHER RELATED ITEMS.

AUSTIN, JOHN W. 12 68143
PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN NORTHWEST FOREST INDUSTRIES, THIRD QUARTER 1968.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 35 PP., ILLUS.
PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUSTRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES, AND OTHER RELATED ITEMS.

AUSTIN, JOHN W., AND HAMILTON, THOMAS E. 6 68044
PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTHWEST FOREST INDUSTRIES, FIRST QUARTER 1968.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 26 PP., ILLUS.
PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUSTRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES, AND OTHER RELATED ITEMS.

*BALCH, R. E., AND MITCHELL, R. G. 12 67160
BALSAM WOOLLY APHID 'ADELGES (= DREYFUSIA, CHERMES) PICEAE' (RATZ.).
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 71-74, ILLUS. (NO COPIES AVAILABLE)

BARNEY, RICHARD J. 6 68059
NATIONAL FIRE DANGER RATING SYSTEM SPREAD INDEX AND BUILDUP INDEX FREQUENCIES FOR INTERIOR ALASKA.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 8 PP., ILLUS.
THIS PAPER REPORTS NATIONAL FIRE DANGER RATING SYSTEM BUILDUP INDEX AND SPREAD INDEX FREQUENCIES ESTABLISHED FOR 21 INTERIOR ALASKA STATIONS COVERING THE 1956-65 FIRE SEASONS. METHODS FOR PREPARING AND UTILIZING INDEX FREQUENCY INFORMATION FOR FIRE PLANNING ARE DISCUSSED INCLUDING CAUTIONS FOR CONSIDERATION.

BARRETT, JAMES W. 10 68119
PRUNING OF PONDEROSA PINE--EFFECT ON GROWTH.
U.S.D.A. FOREST SERV. RES. PAP. PNW-68, 9 PP., ILLUS.
THE RATIO OF EXISTING CROWN LENGTH TO TOTAL HEIGHT HAS AN IMPORTANT BEARING ON THE PROPORTION OF CROWN LENGTH THAT SHOULD BE PRUNED FROM PONDEROSA PINE. THEREFORE, THERE IS A VARIABLE LIMIT TO PROPORTION OF CROWN LENGTH THAT CAN BE REMOVED AND STILL MAINTAIN ACCEPTABLE GROWTH RATES. A TABLE IS PRESENTED THAT SHOWS DIAMETER GROWTH REDUCTION THAT CAN BE EXPECTED FROM REMOVING DIFFERENT PROPORTIONS OF LIVE CROWN LENGTH.

BARRETT, JAMES W. 4 68031
RESPONSE OF PONDEROSA PINE POLE STANDS TO THINNING.
U.S. FOREST SERV. RES. NOTE PNW-77, 11 PP. ILLUS.
THINNING DENSE PONDEROSA PINE POLE STANDS ON SITE V IN NORTHERN WASHINGTON WILL PROMOTE GREATER DIAMETER GROWTH PER TREE AND GREATER WOOD PRODUCTION ON TREES THAT WILL REACH USABLE SIZE.

BECKWITH, ROY C. 7 68064
THE LARGE ASPEN TORTRIX, 'CHORISTONEURA CONFLICTANA' (WLKR.), IN INTERIOR ALASKA.
U.S.D.A. FOREST SERV. RES. NOTE PNW-81, 10 PP., ILLUS.
THE LARGE ASPEN TORTRIX CAUSED EXTENSIVE DEFOLIATION IN INTERIOR ALASKA. ITS LIFE HISTORY AND NATURAL MORTALITY FACTORS ARE DISCUSSED.

BERGER, JOHN M. 3 68025
TIMBER RESOURCE STATISTICS FOR CENTRAL OREGON.
U.S.FOREST SERV. RESOURCE BULL. PNW-24, 38 PP.
A SUMMARY, AS OF JANUARY 1, 1965, OF THE RESULTS OF THE THIRD INVENTORY OF THE TIMBER RESOURCES, AREA, VOLUME, GROWTH, CUT, AND MORTALITY, OF NINE COUNTIES IN CENTRAL OREGON--CROOK, DESCHUTES, GILLIAM, JEFFERSON, KLAMATH, LAKE, SHERMAN, WASCO, AND WHEELER. DATA WERE COLLECTED DURING SUMMER OF 1964.

BERNDT, H. W., AND FOWLER, W. B. 02 68015
CONTRIBUTION OF RIME ICE TO WINTER WATER BALANCE IN UPPER-SLOPE FORESTS OF EASTERN WASHINGTON. (ABSTR.)
NORTHWEST SCI. 42, PP. 29-30. (NO COPIES AVAILABLE)

BINKLEY, VIRGIL W., AND CARSON, WARD W. 09 68097
AN OPERATIONAL TEST OF A NATURAL-SHAPED LOGGING BALLOON.
U.S.D.A. FOREST SERV. RES. NOTE PNW-87, 8 PP., ILLUS.
A THREE-MONTH TEST WAS PERFORMED TO EVALUATE A NATURAL-SHAPED BALLOON UNDER LOGGING CONDITIONS, NEAR REEDSPORT, OREGON. DATA WERE COLLECTED ON THE BALLOON'S AVAILABILITY, MAINTENANCE RECORDS, HANDLING REQUIREMENTS, AND YARDING PERFORMANCE. THE BALLOON WAS FOUND TO BE STABLE AND OPERABLE IN WINDS UP TO 25 M.P.H. AND CAPABLE OF SURVIVING STORMS WHEN PROPERLY BEDDED DOWN.

BINKLEY, VIRGIL W., AND LYSONS, HILTON H. 9 68080
PLANNING SINGLE-SPAN SKYLINES.
U.S.D.A. FOREST SERV. RES. PAP. PNW-66, 10 PP., ILLUS.
SINGLE-SPAN SKYLINES REQUIRE CAREFUL AND THOROUGH PLANNING FOR SUCCESSFUL OPERATION. CRITERIA ARE PRESENTED FOR SELECTING AREAS SUITABLE FOR SKYLINE LOGGING. A

PROCEDURE IS GIVEN THAT DESCRIBES THE STEPS THAT MUST BE CONSIDERED BY THE LOGGING PLANNER, FROM PRELIMINARY CUTTING UNIT LAYOUT TO FINAL LOCATION OF THE SKYLINE ROADS.

BINKLEY, VIRGIL W., AND WILLIAMSON, RICHARD L. 2 68005
SKYLINE EFFECTIVE FOR THINNING DOUGLAS FIR ON STEEP SLOPES.
FOREST IND. 95(2), PP. 60-61, ILLUS.
BEST EFFICIENCY FOR YARDING IN DOUGLAS-FIR THINNINGS ON STEEP SLOPES OCCURS ON SETTINGS WITH SKYLINE ROADS LAID OUT PERPENDICULARLY TO THE CONTOUR AND TIMBER FELLED IN A HERRINGBONE PATTERN.

BOLLEN, W.B. 04 68034
PROPERTIES OF TREE BARKS IN RELATION TO THEIR AGRICULTURAL UTILIZATION. (ABSTR.)
IN 'AMER. CHEM. SOC. ABSTR. OF PAP. 1968', SECT. D, 28 (NO COPIES AVAILABLE)

BOLLEN, W. B., CHEN, C. S., LU, K. C., AND TARRANT, ROBERT F. 12 68126
EFFECT OF STEMFLOW PRECIPITATION ON CHEMICAL AND MICROBIOLOGICAL SOIL PROPERTIES BENEATH A SINGLE ALDER TREE.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 149-156.
STEMFLOW FROM A SINGLE ALDER TREE HAD GREATER CONCENTRATIONS OF NITROGEN AND DISSOLVED SOLIDS THAN THROUGHFALL OR GROSS PRECIPITATION BUT DID NOT INFLUENCE CHEMICAL OR MICROBIAL SOIL PROPERTIES AT A DISTANCE OF ONLY 2 FEET FROM THE STEM.

*BOLLEN, W. B., AND LU, K. C. 12 68127
NITROGEN TRANSFORMATIONS IN SOILS BENEATH RED ALDER AND CONIFERS.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 141-148.
NITROGEN TRANSFORMATIONS, PARTICULARLY NITRIFICATION, ARE RAPID IN SOILS UNDER COASTAL OREGON STANDS OF RED ALDER ('ALNUS RUBRA' BONG.), CONIFERS--DOUGLAS-FIR, WESTERN HEMLOCK, AND SITKA SPRUCE, AND MIXED STANDS OF ALDER AND CONIFERS. NITRIFICATION IS ESPECIALLY RAPID IN THE F LAYER BENEATH ALDER STANDS DESPITE A VERY LOW HYDROGEN-ION CONCENTRATION.

BONES, JAMES T. 10 68139
VOLUME TABLES AND EQUATIONS FOR OLD-GROWTH WESTERN HEMLOCK AND SITKA SPRUCE IN SOUTHEAST ALASKA.
U.S.D.A. FOREST SERV. RES. NOTE PNW-91, 11 PP.
REGRESSION ANALYSIS WAS USED FOR PREDICTING THREE ESTIMATES OF TREE VOLUME WITH THREE INDEPENDENT VARIABLES. VALUES OF INTERCEPT CONSTANTS AND REGRESSION COEFFICIENTS ARE PRESENTED ALONG WITH SELECTED VOLUME TABLES.

BRUCE, DAVID. 03 68010
FOREST MENSURATION--TREE-MEASURING INSTRUMENTS.
MCGRAW-HILL YEARBOOK OF SCIENCE AND TECHNOLOGY 1968, 191-192, ILLUS. (NO COPIES AVAILABLE)
A DESCRIPTION OF CURRENT AND RECENTLY DEVELOPED INSTRUMENTS FOR MEASURING DIAMETER BREAST HIGH, TOTAL HEIGHT, AND UPPER-STEM DIAMETERS OF STANDING TREES.

BRUCE, DAVID 11 68122
LITERATURE ON TIMBER MEASUREMENT PROBLEMS IN THE DOUGLAS-FIR REGION.
U.S.D.A. FOREST SERV. RES. PAP. PNW-67, 28 PP.
THIS BIBLIOGRAPHY ON TIMBER MEASUREMENTS INCLUDES PUBLICATIONS ON THE SUBJECT OF TREE OR LOG MEASUREMENT IN THIS REGION. IT ALSO INCLUDES MANY PUBLICATIONS THAT DESCRIBE MEASUREMENT SYSTEMS OR PROBLEMS ELSEWHERE IN THE UNITED STATES AND CANADA AND A FEW FOREIGN PUBLICATIONS.

BRUCE, DAVID, AND COWLIN, ROBERT W. 2 68017
TIMBER MEASUREMENT PROBLEMS IN THE DOUGLAS-FIR REGION OF WASHINGTON AND OREGON.
U.S. FOREST SERV. RES. PAP. PNW-55, 29 PP., ILLUS.
TIMBER MEASUREMENT PROBLEMS IN THE DOUGLAS-FIR REGION WERE STUDIED BY CONSULTING USERS OF THESE MEASUREMENTS. THIS REPORT SUMMARIZES CURRENT PRACTICES AND THE OBJECTIVES AND STANDARDS OF PERFORMANCE OF VARIOUS USERS AND DISCUSSES ADEQUACY OF CURRENT SYSTEMS IN LIGHT OF THESE REQUIREMENTS.

BRUCE, DAVID, CURTIS, ROBERT O., AND VANCOEVERING, CARYANNE. 9 68082
DEVELOPMENT OF A SYSTEM OF TAPER AND VOLUME TABLES FOR RED ALDER.
FOREST SCIENCE, 14, PP. 339-350, ILLUS.
THE METHODS USED IN PREPARING THE NEW RED ALDER TAPER AND VOLUME TABLES ARE DESCRIBED. THESE METHODS, WHICH SHOULD ALSO BE APPLICABLE TO OTHER SPECIES, PROVIDE A UNIFIED SYSTEM OF TABLES FOR DIFFERENT UNITS OF MEASURE AND LIMITS OF MERCHANTABILITY.

*BULLA, L. A., JR., *GILMOUR, C. M., AND BOLLEN, W. B. 05 68046
ENZYMATIC VERSUS NONENZYMATIC DENITRIFICATION IN SOIL. (ABSTR.)
AMER. SOC. MICROBIOL. BACTERIOL. PROC. 1968, P. 4, A-22. (NO COPIES AVAILABLE)

BURKE, HUBERT D., *LEWIS, GLENN M., AND *ORR, HOWARD R. 3 68032
A METHOD FOR CLASSIFYING SCENERY FROM A ROADWAY.
PARK PRACTICE GUIDELINE, DEVELOPMENT, ART. 22, PP. 125-141, ILLUS.
THE 'CHARACTERISTIC' LANDSCAPE IS USED AS A STANDARD TO RECORD SCENIC VALUES AND TO SUPPLEMENT EXISTING METHODS OF CLASSIFYING SCENERY. LANDSCAPES, I.E. PLAINS, FOOTHILLS OR MOUNTAINS, ARE RATED AGAINST THEIR OWN CHARACTERISTIC APPEARANCE. SCENIC VALUES USED ARE--CHARACTERISTIC (C), SUPERIOR (+1), OR CONTAINS SOME WORK OF MAN THAT DETRACTS FROM THE CHARACTERISTIC SCENE (-1). PHOTOGRAPHS ILLUSTRATE THE APPLICATION OF THE METHOD. EXAMPLES ARE GIVEN TO SHOW HOW THESE VALUES CAN BE USED IN SCENIC MANAGEMENT.

*CAMPBELL, FREDERICK L., HENDEE, JOHN C., AND *CLARK, ROGER. 12 68151
LAW AND ORDER IN PUBLIC PARKS.
PARKS AND RECREATION 3(12), PP. 28-31, PP. 51-55, ILLUS.
INCREASING USE OF INTENSIVELY DEVELOPED CAMPGROUNDS IN FORESTS AND PARKS IS ACCOMPANIED BY INCREASING ILLEGAL AND DEPRECIATIVE BEHAVIOR. OBSERVATIONS FROM STUDY OF THESE BEHAVIOR PROBLEMS IN THREE WASHINGTON STATE CAMPGROUNDS ARE DISCUSSED. SOME UNDERLYING CAUSES AND POSSIBLE SOLUTIONS ARE SUGGESTED.

CAROLIN, V. M., AND *BAXTER, J. W. 09 68123
BUD CHARACTERISTICS OF PONDEROSA PINE RELATED TO POTENTIAL DAMAGE BY THE EUROPEAN PINE SHOOT MOTH.
U.S.D.A. FOREST SERV. RES. NOTE PNW-90, 17 PP., ILLUS.
NUMBER AND SIZES OF BUDS IN APICAL CLUSTERS OF PONDEROSA PINE DIFFERED AMONG LOCATIONS, BUT APPEARED TO CONSTITUTE FOUR DIFFERENT PATTERNS. RESIN CANALS IN TERMINAL BUDS WERE LARGER, MORE NUMEROUS, AND DEVELOPED MORE RAPIDLY THAN THOSE IN LATERAL BUDS. FINDINGS ARE RELATED TO THE SHOOT MOTH THREAT TO WESTERN PINES.

CAROLIN, V. M. JR., AND *KNOPF, J. A. E. 09 68124
THE PANDORA MOTH.
U. S. DEP. AGR. FOREST PEST LEAFLET 114, 7 PP., ILLUS.
THE PANDORA MOTH PERIODICALLY CAUSES SEVERE DAMAGE TO PINE FORESTS IN WESTERN UNITED STATES. THE INSECT HAS A 2-YEAR LIFE CYCLE, AND HEAVY DAMAGE NORMALLY OCCURS ONLY IN THE YEAR LARGE LARVAE ARE FEEDING. ITS LIFE HISTORY IN OREGON AND CALIFORNIA DIFFERS SLIGHTLY FROM THAT IN THE ROCKY MOUNTAINS.

CAROLIN, V. M. AND *LEJEUNE, R. R. 12 67162
WESTERN HEMLOCK LOOPER 'LAMBDINA FISCELLARIA LUGUBROSA' HULST.
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 123-125, ILLUS. (NO COPIES AVAILABLE)
INFORMATION IS GIVEN ON DISTRIBUTION, HOSTS, DAMAGE, LIFE HISTORY AND CONTROL MEASURES. RESEARCH SHOULD DEVELOP NEW TECHNIQUES FOR DETECTING POPULATION BUILDUPS AND PREDICTING HAZARD, AND CONTINUE EVALUATION OF CONTROL BY MICROBIAL INSECTICIDES AND FOREST MANAGEMENT PRACTICES.

CHAPPELLE, DANIEL E., AND SASSAMAN, ROBERT W. 10 68146
A COMPUTER PROGRAM FOR SCHEDULING ALLOWABLE CUT USING EITHER AREA OR VOLUME REGULATION DURING SEQUENTIAL PLANNING PERIODS.
U.S.D.A. FOREST SERV. RES. NOTE PNW-93, 9 PP., ILLUS.
THIS NOTE DESCRIBES A COMPUTER PROGRAM, SORAC, WHICH CALCULATES ALLOWABLE CUT USING EITHER AREA OR VOLUME REGULATION AT THE BEGINNING OF EACH PLANNING PERIOD WITHIN A ROTATION. THIS PROGRAM ENABLES THE TIMBER MANAGEMENT PLANNER TO TRACE FUTURE ALLOWABLE CUT OVER TIME AND TO INTRODUCE HIS EXPECTATIONS AS PROGRAM INPUTS FOR EVERY PLANNING PERIOD. SORAC OUTPUT IS COMPARED WITH OUTPUTS OF AREA AND ARVOL COMPUTER PROGRAMS FOR A SAMPLE FOREST MANAGEMENT UNIT.

*CHAWLA, S. S., AND *HARWOOD, R. F. 4 68038
ARTIFICIAL DIETS FOR THE EUROPEAN PINE SHOOT MOTH, 'RHYACIONIA BUOLIANA' (SCHIFFERMULLER) (LEPIDOPTERA, OLETHREUTIDAE).
WASH. AGR. EXP. STA. TECH. BULL. 59, 13 PP., ILLUS.
THE WHEAT GERM DIET OF BERGER, WITH MODIFICATIONS, SHOWS PROMISE FOR MASS-REARING THE EUROPEAN PINE SHOOT MOTH. MORTALITY OF FIELD-COLLECTED LARVAE AFTER THE FIRST INSTAR WAS LOW, HOWEVER , MORTALITY OF LARVAE REARED FROM THE FIRST INSTAR WAS HIGH, AFTER 60 DAYS. CAUSES OF DIFFERENCE ARE UNKNOWN.

CHILDS, T. W. 1 68023
COMANDRA RUST DAMAGE TO PONDEROSA PINE IN OREGON AND WASHINGTON.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 8 PP. (UNNUMBERED), ILLUS.
THE DAMAGING RUST, 'CRONARTIUM COMANDRAE,' IS COMMON IN MANY LOCALITIES BUT IS OFTEN OVERLOOKED OR CONFUSED WITH OTHER CAUSES OF DAMAGE. CANKERS IN LOWER CROWNS ARE IMMEDIATE THREATS TO YOUNG-MATURE TREES, BUT RUST-KILLED TOPS IN OLD-GROWTH TIMBER ARE NOT NECESSARILY INDICATIVE OF HIGH-RISK TREES. DAMAGE IN THINNED STANDS CAN BE REDUCED BY CAREFUL SELECTION OF CROP TREES. THIS RUST IS OF LITTLE IMPORTANCE IN UNTHINNED YOUNG STANDS.

CHILDS, T. W. 12 68159
ELYTRODERMA DISEASE OF PONDEROSA PINE IN THE PACIFIC NORTHWEST.
U.S.D.A. FOREST SERV. RES. PAP. PNW-69, 45 PP., ILLUS.
THE DISEASE IS CAUSED BY 'ELYTRODERMA DEFORMANS' AND INTERMITTENTLY RESULTS IN SEVERE LOCAL DAMAGE TO PONDEROSA PINE. DISEASE SYMPTOMS, VEGETATIVE SPREAD, BEHAVIOR IN SAPLING STANDS, AND DAMAGE TO OLD GROWTH ARE DISCUSSED. GUIDELINES ARE GIVEN FOR CONTROL BY FOREST MANAGEMENT PRACTICES.

CHILDS, T. W. 12 67158
ELYTRODERMA NEEDLE CAST 'ELYTRODERMA DEFORMANS' (WEIR) DARKER.
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES, AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 45-47, ILLUS. (NO COPIES AVAILABLE)

COCHRAN, P. H. 7 68062
CAN THINNING SLASH CAUSE A NITROGEN DEFICIENCY IN PUMICE SOILS OF CENTRAL OREGON.
U.S.D.A. FOREST SERV. RES. NOTE PNW-82, 11 PP.
DECOMPOSITION OF THINNING SLASH DEPOSITED ON THE SOIL SURFACE AND DECOMPOSITION OF ROOTS OF CUT TREES SHOULD NOT ADVERSELY AFFECT SOIL NITROGEN AVAILABLE TO THE REMAINING TREES IN THE PUMICE SOIL REGION. INCORPORATION OF CHIPPED SLASH INTO THE SOIL MIGHT CAUSE A TEMPORARY NITROGEN DEFICIENCY. THIS DEFICIENCY COULD BE PREVENTED BY FERTILIZATION.

COPES, DON. 12 68158
AN ANALYSIS OF DECISION ALTERNATIVES IN THE COST OF ESTABLISHING KNOWN COMPATIBLE GRAFTS IN THE SIUSLAW N.F. SEED ORCHARD.
IFA TREE IMPROVEMENT NEWSLETTER NO. 9, PP. 9-12. (NO COPIES AVAILABLE)
TOTAL COSTS PER CLONE WERE ESTIMATED FOR NEW ORCHARDS USING TWO METHODS TO REDUCE NUMBERS OF INCOMPATIBLE GRAFTS. MOST SATISFACTORY METHOD WAS TO TEST EACH SCION-STOCK COMBINATION.

COPES, DON 11 68109
APPLYING INCOMPATIBILITY DETECTION TO THE SEED ORCHARD. (ABSTR.)
IN 'ABSTRACTS OF PRESENTED PAPERS.' WEST. FOREST GENETICS ASS. ANN. MTG. 1968, P. 2. (NO COPIES AVAILABLE)
DISCUSSES DECISIONMAKING PROCESS IN CHOOSING BETWEEN ALTERNATIVE METHODS OF TESTING FOR GRAFT INCOMPATIBILITY DEPENDING UPON DESIRED PERCENT COMPATIBILITY, ORCHARD DESIGN, AND WHETHER PLANTED OR POTTED ROOTSTOCKS ARE USED.

COPES, DONALD. 08 67165
GRAFT INCOMPATIBILITY SYMPTOM DEVELOPMENT IN DOUGLAS-FIR AND AN ORCHARD SCREENING METHOD. (ABSTR.)
WEST. FOREST GENET. ASS. MEET. 1967, P. 4. (NO COPIES AVAILABLE)
AN ORCHARD SCREENING TECHNIQUE WAS DESCRIBED WHICH UTILIZED TWO FACTORS--2D-YEAR INCOMPATIBILITY MORTALITY AND FREQUENCY OF XYLEM WOUNDING AT THE START OF THE 2D YEAR.

COPES, DONALD. 08 68099
GRAFTING INCOMPATIBILITY IN DOUGLAS FIR.
INTERNATIONAL PLANT PROPAGATORS' SOC., PP. 130-138, ILLUS.
GRAFTING OF DOUGLAS-FIR ('PSEUDOTSUGA MENZIESII' (MIRB.) FRANCO) STARTED COMMERCIALLY ON THE WEST COAST IN THE LATE 1950'S. CONTINUING INCOMPATIBILITY LOSSES HAVE CAUSED SEED ORCHARDISTS TO BECOME INCREASINGLY AWARE OF THE SEVERITY OF THE PROBLEM. GRAFT SURVIVAL DATA IS DISCUSSED.

CROUCH, GLENN L. 2 68024
CLIPPING OF WOODY PLANTS BY MOUNTAIN BEAVER.
J. MAMMAL. 49, PP. 151-152.
MOUNTAIN BEAVER CLIP STEMS AND BRANCHES OF MANY WOODY PLANTS IN THE TILLAMOOK BURN. AMONG 12 SPECIES STUDIED, VINE MAPLE, RED HUCKLEBERRY (WHORTLEBERRY), AND RED ALDER WERE CLIPPED MOST FREQUENTLY.

CROUCH, GLENN L. 07 68093
FORAGE AVAILABILITY IN RELATION TO BROWSING OF DOUGLAS-FIR SEEDLINGS BY BLACK-TAILED DEER.
JOURNAL OF WILDLIFE MANAGEMENT 32(3), PP. 542-553, ILLUS.
A STUDY OF FORAGE AVAILABILITY AND UTILIZATION INDICATED THAT BROWZING OF DOUGLAS-FIR WILL CONTINUE UNTIL SEEDLINGS GROW OUT OF REACH OF DEER BECAUSE THE FIR IS AN IMPORTANT FOOD DURING WINTER WHEN PREFERRED GREEN FORAGE IS LEAST AVAILABLE.

CROUCH, GLENN L. 8 68089
SPRING-SEASON DEER BROWSING OF DOUGLAS-FIR ON THE CAPITOL FOREST IN WESTERN WASHINGTON.
U.S.D.A. FOREST SERV. RES. NOTE PNW-84, 8 PP., ILLUS.
THE BEGINNING AND ENDING OF TREE BROWSING DID NOT SEEM TO BE RELATED TO ANY VISUAL GROWTH-STAGE CHARACTERISTIC EXCEPT BUD BURST. LEADERS WERE GROWING RAPIDLY WHEN BROWSING BEGAN AND ENDED. AVAILABILITY OF OTHER VEGETATION IN SIMILAR STAGES OF DEVELOPMENT ALSO APPEARED UNRELATED TO DOUGLAS-FIR BROWSING.

CROUCH, GLENN L., AND *PAULSON, NEIL R. 11 68140
EFFECTS OF PROTECTION FROM DEER ON SURVIVAL AND GROWTH OF DOUGLAS-FIR SEEDLINGS.
U.S.D.A. FOREST SERV. RES. NOTE PNW-94, 6 PP., ILLUS.
PROTECTION FROM DEER HAD LITTLE EFFECT ON SURVIVAL OF PLANTED AND NATURAL DOUGLAS-FIR SEEDLINGS AFTER EIGHT GROWING SEASONS. PROTECTED TREES WERE SLIGHTLY TALLER THAN UNPROTECTED TREES. TREES FROM NATURAL SEEDFALL WERE TALLER THAN PLANTED TREES. UNPROTECTED PLANTED STOCK WAS SHORTER THAN ITS PROTECTED COUNTERPART AND SHOWED NO SIGN OF 'CATCHING UP'. THIS DIFFERENCE SHOULD BE OF LITTLE CONSEQUENCE AFTER A CUTTING CYCLE.

CURTIS, ROBERT O. 7 68061
WHICH AVERAGE DIAMETER.
J. FOREST. 66, P. 570.
BOTH ARITHMETIC MEAN DIAMETER AND DIAMETER OF THE TREE OF MEAN BASAL AREA ARE OFTEN LOOSELY REFERRED TO AS 'AVERAGE DIAMETER' BY FORESTERS. TERMINOLOGY IS SUGGESTED WHICH ELIMINATES THIS AMBIGUITY, AND IS CONSISTENT WITH GENERALLY ACCEPTED STATISTICAL TERMINOLOGY.

CURTIS, ROBERT O., AND BRUCE, DAVID. 1 68001
TREE HEIGHTS WITHOUT A TAPE.
J. FOREST. 66, PP. 60-61, ILLUS.
WITH A LIGHTWEIGHT TELESCOPING MEASURING ROD AND A CLINOMETER GRADUATED IN PERCENT SLOPE, THE PRINCIPLE OF THE CHRISTEN HYPSOMETER CAN BE USED TO ESTIMATE TREE HEIGHTS WITHOUT NEED FOR TAPE MEASUREMENT OF A HORIZONTAL BASE LINE. UNDER CERTAIN CONDITIONS, SAVINGS IN TIME AND LABOR CAN BE SUBSTANTIAL.

CURTIS, ROBERT O., BRUCE, DAVID, AND VANCOEVERING, CARYANNE. 4 68039
VOLUME AND TAPER TABLES FOR RED ALDER.
U.S. FOREST SERV. RES. PAP. PNW-56, 35 PP., ILLUS.
NEW TABLES FOR RED ALDER GIVE AVERAGE UPPER-STEM DIAMETERS BY TREE D.B.H. AND TOTAL HEIGHT CLASSES, AND ALSO GIVE CORRESPONDING VOLUMES IN ALTERNATIVE UNITS AND FOR ALTERNATIVE TOP DIAMETER LIMITS AND SCALING ASSUMPTIONS. EQUIVALENT EQUATIONS FOR USE WITH COMPUTERS ARE INCLUDED.

DATERMAN, G. E. 7 68070
LABORATORY MATING OF THE EUROPEAN PINE SHOOT MOTH, 'RHYACIONIA BUOLIANA.'
ANN. ENTOMOL. SOC. AMER. 61, PP. 920-923, ILLUS.
A TECHNIQUE IS DESCRIBED FOR MATING THE EUROPEAN PINE MOTH, 'RHYACIONIA BUOLIANA' (SCHIFFERMULLER), IN THE LABORATORY. TWENTY-FOUR PERCENT OF ALL MOTHS USED AND 36 PERCENT OF FEMALES COULD BE INDUCED TO MATE WITHIN A STIPULATED TIME PERIOD. PRODUCTION OF SEX ATTRACTANT BY FEMALES WAS FOUND NECESSARY TO INDUCE MATING. BASED ON DISSECTIONS AND BEHAVIOR OF MATED INDIVIDUALS, IT WAS DETERMINED THAT FEMALES MATE NO MORE THAN ONCE. RECURRING PROBLEMS ASSOCIATED WITH THE SUCCESS OF THE TECHNIQUE ARE DISCUSSED.

*DYER, E. D. A., AND WRIGHT, K. H. 12 67157
STRIPED AMBROSIA BEETLE 'TRYPODENDRON LINEATUM' (OLIV.)
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 27-30, ILLUS. (NO COPIES AVAILABLE)

EDGREN, JAMES W. 09 68104
POTENTIAL DAMAGE TO FOREST TREE SEED DURING PROCESSING, PROTECTIVE TREATMENT, AND DISSEMINATION.
U.S.D.A. FOREST SERV. RES. NOTE PNW-89, 8 PP., ILLUS.
TREE SEED MAY BE DAMAGED IN PROCESSING, BY CHEMICAL TREATMENT, OR DURING DISSEMINATION. DAMAGE MAY BE CUMULATIVE BUT THE AMOUNT OF DAMAGE FROM DIFFERENT CAUSES IS NOT KNOWN. STUDIES ARE NEEDED TO IDENTIFY OPTIMUM TREATMENT FOR THIS VALUABLE COMMODITY.

FAHNESTOCK, GEORGE R. 5 68054
FIRE HAZARD FROM PRECOMMERCIAL THINNING OF PONDEROSA PINE.
U.S.D.A. FOREST SERV. RES. PAP. PNW-57, 16 PP., ILLUS.
SLASH FROM PRECOMMERCIAL THINNING OF PONDEROSA PINE STANDS IN THE PACIFIC NORTHWEST CAN BE A HIGH TO EXTREME FIRE HAZARD FOR 5 YEARS OR LONGER.

FAHNESTOCK, GEORGE R. 1 68002
FORESTRY AND THE SOCIAL SCIENCES--A FORESTER'S VIEW.
J. FOREST. 66, PP. 22-25.
AS POPULATION SIZE, MOBILITY, AND HENCE FOREST USE INCREASE, 'PEOPLE' PROBLEMS IN FORESTRY ARE BECOMING HARDER TO UNDERSTAND AND SOLVE THAN RESOURCE PROBLEMS. FORESTERS MUST ACTIVELY SEEK AND WILLINGLY ACCEPT THE HELP OF SOCIAL SCIENTISTS. RECENT DEVELOPMENTS IN THIS DIRECTION ARE OPTIMISTIC.

FARR, WILBUR A. 12 67147
GROWTH AND YIELD OF WELL-STOCKED WHITE SPRUCE STANDS IN ALASKA.
U.S. FOREST SERV. RES. PAP. PNW-53, 30 PP., ILLUS.
SITE INDEX CURVES AND NORMAL YIELD TABLES ARE PRESENTED FOR EVEN-AGED STANDS OF WHITE SPRUCE ('PICEA GLAUCA' (MOENCH) VOSS) IN INTERIOR ALASKA. SITE IS BASED ON HEIGHT OF THE FOUR TALLEST TREES PER ACRE AT INDEX AGE 100 YEARS. YIELDS ARE RELATED TO COMBINATIONS OF THE VARIABLES SITE INDEX AND AGE.

FLORA, DONALD F. 12 67145
ECONOMICS--WILL ECONOMISTS START TELLING THE WHOLE TRUTH.
IN 'WESTERN FOREST PEST CONDITIONS.' WEST. FOREST. AND CONSERV. ASS. WEST. FOREST PEST COMM. MEETING 1967, PP. 24-26.
IN EVALUATING PEST CONTROL PROGRAMS, ECONOMISTS HAVE GENERALLY IGNORED PRICE EFFECTS, RISKS OF SURVIVAL TO HARVEST AGE, AND CERTAIN ELEMENTS OF THE FOREST POLICY ENVIRONMENT.

FLORA, DONALD F. 1 68003
POOH ON DAMAGE APPRAISAL.
J. FOREST. 66, PP. 12-16, ILLUS.
A CRITIQUE OF SEVERAL PHYSICAL AND ECONOMIC MEASURES OF FIRE AND PEST DAMAGE TO TIMBER. PITFALLS IN ECONOMIC DAMAGE APPRAISAL ARE EMPHASIZED BECAUSE THEY ARE OFTEN IGNORED IN HASTY STUDIES.

FRANKLIN, JERRY F. 7 68073
CONE PRODUCTION BY UPPER-SLOPE CONIFERS.
U.S.D.A. FOREST SERV. RES. PAP. PNW-60, 21 PP., ILLUS.
CONE PRODUCTION BY MATURE NOBLE, PACIFIC SILVER, SUBALPINE, GRAND AND SHASTA RED FIRS, WESTERN WHITE PINE, MOUNTAIN HEMLOCK, AND ENGELMANN SPRUCE TREES HAS BEEN OBSERVED ANNUALLY SINCE 1961. GENERALLY, CONES ARE PRODUCED BY ONE OR MORE SPECIES EVERY YEAR. SIGNIFICANT INTRASPECIFIC DIFFERENCES IN CONE PRODUCTION BETWEEN DOMINANTS MAKE SELECTION OF THE MOST PROLIFIC AS LEAVE TREES IMPORTANT IN PARTIAL CUTTINGS.

FRANKLIN, JERRY F. 11 68108
COTYLEDON NUMBER AND SEED WEIGHT IN THE NOBLE-RED FIR SPECIES COMPLEX. (ABSTR.)
IN 'ABSTRACTS OF PRESENTED PAPERS.' WEST. FOREST GENETICS ASS. ANN. MTG. 1968, P. 9. (NO COPIES AVAILABLE)

FRANKLIN, JERRY F. 03 68066
THE REFORESTATION RESEARCH PROGRAM, UPPER-SLOPE REFORESTATION.
U.S.D.A. FOREST SERV., REG. 6, FIRST REFORESTATION WORKSHOP PROC. 1968, PP. 29-34. (NO COPIES AVAILABLE)
REVIEWS RESEARCH IN PROGRESS ON NATURAL AND ARTIFICIAL REGENERATION IN HIGH-ELEVATION TRUE FIR-HEMLOCK TYPES.

FRANKLIN, JERRY F., DYRNESS, C. T., 12 68128
MOORE, DUANE G., AND TARRANT, ROBERT F.
CHEMICAL SOIL PROPERTIES UNDER COASTAL OREGON STANDS OF ALDER AND CONIFERS.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 157-172.
ORGANIC MATTER, TOTAL NITROGEN, AND ACIDITY WERE SIGNIFICANTLY GREATER IN 'A' HORIZONS UNDER ALDER AND MIXED STANDS. 'A' HORIZONS UNDER CONIFER STANDS AVERAGED THREE TIMES RICHER IN BASES THAN THOSE UNDER ALDER STANDS. SIMILAR DIFFERENCES, BUT OF A MUCH SMALLER MAGNITUDE, WERE OBSERVED IN THE 'B' HORIZONS. THESE EFFECTS MAY INDICATE GREATER PRODUCTION OF ACID DECOMPOSITION PRODUCTS IN THE ORGANIC-AND NITROGEN-RICHER ALDER SOILS.

FRANKLIN, JERRY F., AND *GREATHOUSE, THOMAS E. 02 68013
COTYLEDON NUMBERS IN THE NOBLE-CALIFORNIA RED FIR SPECIES COMPLEX. (ABSTR.)
NORTHWEST SCI. 42, PP. 32-33. (NO COPIES AVAILABLE)

FRANKLIN, JERRY F., AND HOFFMAN, JOHN. 5 68052
TWO TESTS OF WHITE PINE, TRUE FIR, AND DOUGLAS-FIR SEEDSPOTTING IN THE CASCADE RANGE.
U.S.D.A. FOREST SERV. RES. NOTE PNW-80, 11 PP., ILLUS.
SATISFACTORY STOCKING WAS OBTAINED ON SEEDSPOTS PROTECTED BY WIRE SCREENS BUT GENERALLY NOT ON UNSCREENED SPOTS DESPITE EXTENSIVE BAITING OF STUDY AREAS. WESTERN WHITE PINE WAS MOST SUCCESSFUL SPECIES USED AND TRUE FIRS WERE LEAST SUCCESSFUL. DAMPING-OFF, RODENTS, AND INSECTS WERE RESPONSIBLE FOR MOST SEEDLING MORTALITY.

FRANKLIN, JERRY F., AND KRUEGER, KENNETH W. 5 68037
GERMINATION OF TRUE FIR AND MOUNTAIN HEMLOCK SEED ON SNOW.
J. FOREST. 66, PP. 416-417, ILLUS.
SEEDS OF FIVE 'ABIES' SPP. AND 'TSUGA MERTENSIANA' HAVE OFTEN OBSERVED GERMINATING ON LATE-PERSISTING SNOWBANKS IN THE PACIFIC NORTHWEST. NOBLE FIR SEEDS ALSO GERMINATED IN INTACT CONES PRESERVED IN SNOWBANKS.

FRANKLIN, JERRY F., AND *PECHANEC, ANNA A. 12 68129
COMPARISON OF VEGETATION IN ADJACENT ALDER, CONIFER, AND MIXED ALDER-CONIFER COMMUNITIES. I. UNDERSTORY VEGETATION AND STAND STRUCTURE.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 37-43.
SHRUBBY SPECIES WERE CONFINED MAINLY TO THE PURE ALDER STAND, WHERE THEY FORMED A DENSE LAYER. HERBACEOUS PLANTS WERE BEST DEVELOPED IN THE ALDER AND MIXED STANDS AND GROUND-DWELLING CRYPTOGAMS IN THE MIXED AND CONIFER STANDS. DIFFERENCES IN CANOPY DENSITY AND, PERHAPS, IN NUTRITION PROBABLY ACCOUNTED FOR MOST OF THE CONTRASTS. ALTHOUGH CURRENT REGENERATION OF TREES WAS UNIFORMLY ABSENT, SUPPRESSED SITKA SPRUCE SAPLINGS PERSISTING IN THE ALDER AND MIXED STANDS COULD, BY RESPONDING TO FUTURE RELEASE, PARTIALLY REPLACE A DETERIORATING ALDER OVERSTORY.

FRANKLIN, JERRY F., AND TRAPPE, JAMES M. 6 68045
NATURAL AREAS--NEEDS, CONCEPTS, AND CRITERIA.
J. FOREST. 66, PP. 456-461, ILLUS.
AN ADEQUATE, REPRESENTATIVE NATURAL AREA SYSTEM IS ESSENTIAL FOR CONTINUED PROGRESS IN SCIENTIFIC FORESTRY AS WELL AS IN OTHER FIELDS OF BIOLOGICAL RESEARCH. SOME SPECIFIC EXAMPLES SHOWING THE RELEVANCE OF NATURAL AREAS TO RESOURCE MANAGEMENT AND SCIENCE IN GENERAL ARE PROVIDED IN THIS ARTICLE. SUGGESTIONS AS TO THE KIND OF AREAS NEEDED AND CRITERIA FORESTERS CAN USE IN DETERMINING SUITABILITY OF SPECIFIC AREAS ARE INCLUDED.

*GRAHAM, ROBERT D., AND ESTEP, LLOYD M. 04 66109
EFFECT OF INCISING AND SAW KERFS ON CHECKING OF PRESSURE TREATED DOUGLAS FIR SPAR CROSSARMS.
AMER. WOOD-PRESERVERS' ASSOC. PROC. 1966, 4 PP., ILLUS. (NO COPIES AVAILABLE)
INCISING WAS INEFFECTIVE. KERFS PREVENTED LARGE CHECKS, BUT SOME SMALL CHECKS CONTAINED UNTREATED WOOD. THE COMBINATION OF A KERF AND INCISIONS PREVENTED BOTH EXCESSIVE CHECKING AND EXPOSURE OF UNTREATED WOOD FOR FOUR SUMMERS, WITH INDICATIONS THAT THE EFFECT WOULD BE PERMANENT.

GRATKOWSKI, H. 11 67151
HEAT-INDUCED GERMINATION OF REDSTEM CEANOTHUS SEEDS. (ABSTR.)
IN 'RESEARCH PROGRESS REPORT.' WEST. WEED CONTROL CONF. 1967, PP. 24-25. (NO COPIES AVAILABLE)

GRATKOWSKI, H. 11 67153
HEIGHT GROWTH OF DOUGLAS-FIRS RELEASED FROM VARNISHLEAF CEANOTHUS. (ABSTR.)
IN 'RESEARCH PROGRESS REPORT.' WEST. WEED CONTROL CONF. 1967, PP. 25-26. (NO COPIES AVAILABLE)

GRATKOWSKI, H. 11 67152
HERBICIDES FAIL TO CONTROL CEANOTHUS PROSTRATUS. (ABSTR.)
IN 'RESEARCH PROGRESS REPORT.' WEST. WEED CONTROL CONF. 1967, P. 25. (NO COPIES AVAILABLE)

GRATKOWSKI, H. 6 68051
REPEATED SPRAYING TO CONTROL SOUTHWEST OREGON BRUSH SPECIES.
U.S.D.A. FOREST SERV. RES. PAP. PNW-59, 6 PP.
WILD-LAND SHRUBS DIFFER IN SUSCEPTIBILITY TO HERBICIDES, AND FORESTERS MUST KNOW WHETHER ONE OR MORE SPRAYINGS WILL BE NEEDED TO ATTAIN A DESIRED DEGREE OF BRUSH CONTROL. THIS PAPER SHOWS DEGREE OF KILL OBTAINED WITH UP TO THREE MIDSUMMER SPRAY TREATMENTS APPLIED WITH KNAPSACK SPRAYER ON 13 SOUTHWEST OREGON BRUSH SPECIES. A COMPARISON WITH SIMILAR AERIAL SPRAY TREATMENTS INDICATES THE RESULTS CAN BE USED TO PREJUDGE EFFECTIVENESS OF AERIAL SPRAYING.

GRATKOWSKI, H., AND ANDERSON, LYLE. 12 68154
RECLAMATION OF NONSPROUTING GREENLEAF MANZANITA BRUSHFIELDS IN THE CASCADE RANGE.
U.S.D.A. FOREST SERV. RES. PAP. PNW-72, 8 PP., ILLUS.
SMALL PLOT AND AERIAL SPRAY TRIALS HAVE SHOWN THAT NONSPROUTING GREENLEAF MANZANITA IN THE CASCADE RANGE CAN BE KILLED BY A SINGLE AERIAL APPLICATION OF 3 POUNDS AE OF 2,4-D PER ACRE. CONIFERS PLANTED AMID THE DEAD SHRUBS SHOULD BE CAGED IN HARDWARE CLOTH CYLINDERS FOR PROTECTION FROM RABBIT BROWSING. LESS RABBIT DAMAGE WAS SUSTAINED BY TREES ON MECHANICALLY CLEARED SITES THAN UNDER CHEMICALLY KILLED BRUSH. APPROXIMATE COSTS PER ACRE ARE GIVEN FOR ALTERNATIVE METHODS OF BRUSHFIELD RECLAMATION.

GREGORY, ROBERT A., AND *WILSON, BRAYTON F. 6 68047
A COMPARISON OF CAMBIAL ACTIVITY OF WHITE SPRUCE IN ALASKA AND NEW ENGLAND.
CAN. J. OF BOTANY. 46, PP. 733-734, ILLUS.
WHITE SPRUCE TREES (PICEA GLAUCA (MOENCH) VOSS) PRODUCING ANNUALLY THE SAME NUMBER OF TRACHEIDS HAD CAMBIAL ACTIVITY ABOUT HALF AS LONG IN ALASKA (65 DEGREES N) AS IN NEW ENGLAND (43 DEGREES N). RATE OF CELL PRODUCTION WAS SIGNIFICANTLY GREATER IN ALASKAN TREES DUE TO A HIGHER RATE OF CELL DIVISION. THE POPULATION OF DIVIDING CELLS WAS SIMILAR IN BOTH REGIONS.

GUY, WALLACE C. 1 68009
HIGH MAGNIFICATION IN MACRO WORK.
76TH INT. EXPOSITION PROF. PHOTOGR. AND 15TH NAT. IND. PHOTOGR. CONF. 1967, PP. 53-55.
A SLIDE ILLUSTRATED TALK ON PHOTOMACROGRAPHY, DESCRIBING THE TECHNIQUES OF LIGHTING, EXPOSURE, BACKGROUNDS, AND SUBJECT HANDLING. ALSO COVERS SUITABLE CAMERAS, ACCESSORIES, AND THE SPECIAL MACRO LENSES.

HALLIN, WILLIAM E. 09 68100
SOIL MOISTURE TENSION VARIATION ON CUTOVERS IN SOUTHWESTERN OREGON.
U.S.D.A. FOREST SERV. RES. PAP. PNW-58, 18 PP., ILLUS.
ESTIMATING SOIL MOISTURE TENSION FROM SOIL MOISTURE CONTENT, GROWTH, EFFECT OF SILVICULTURAL TREATMENT ON GROWTH AND RESPONSE, AND SOME POSITIVE STEPS TO IMPROVE SUCCESS OF PLANTING OR SEEDING ARE PRESENTED.

HALLIN, WILLIAM E. 4 68030
SOIL SURFACE TEMPERATURES ON CUTOVERS IN SOUTHWEST OREGON.
U.S. FOREST SERV. RES. NOTE PNW-78, 17 PP., ILLUS.
DISCUSSES SOIL TEMPERATURES ONE CAN EXPECT ON VARIOUS MICRO AND MACRO SITES IN SOUTHWEST OREGON. GIVES RECOMMENDATIONS FOR HARVEST TECHNIQUES ON STEEP SOUTHERLY SLOPES.

HAMILTON, THOMAS E. 3 68021
PRODUCTION, PRICES, EMPLOYMENT, AND TRADE IN PACIFIC NORTHWEST FOREST INDUSTRIES, FOURTH QUARTER 1967.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 28 PP., ILLUS.
PROVIDES CURRENT INFORMATION ON LUMBER AND PLYWOOD PRODUCTION AND PRICES, EMPLOYMENT IN THE FOREST INDUSTRIES, INTERNATIONAL TRADE IN LOGS AND LUMBER, VOLUME AND AVERAGE PRICES OF STUMPAGE SOLD BY PUBLIC AGENCIES, AND OTHER RELATED ITEMS.

*HANKS, LELAND F., AND *SWANSON, CARL W. 11 67150
LUMBER GRADE YIELDS FROM PAPER BIRCH AND BALSAM POPLAR LOGS IN THE SUSITNA RIVER VALLEY, ALASKA.
U.S.D.A. FOREST SERV. RES. PAP. PNW-51, 30 PP., ILLUS.
A STUDY WAS CONDUCTED AT WASILLA, ALASKA, IN 1964 TO DETERMINE THE LUMBER GRADE RECOVERY FROM PAPER BIRCH AND BALSAM POPLAR LOGS. ACTUAL RECOVERIES ARE SUMMARIZED BY SCALING DIAMETER FOR EACH OF THE THREE U.S. FOREST SERVICE LOG GRADES. THIS INFORMATION, WHEN COUPLED WITH PERTINENT LUMBER PRICES, MAY BE USED TO ESTIMATE THE VALUE OF LUMBER TO BE SAWED FROM BIRCH OR POPLAR LOGS IN ALASKA.

HARD, J. S., AND SCHMIEGE, D. C. 10 68092
THE HEMLOCK SAWFLY IN SOUTHEAST ALASKA.
U.S.D.A. FOREST SERV. RES. PAP. PNW-65, 11 PP., ILLUS.
THE HEMLOCK SAWFLY HAS ONE GENERATION PER YEAR AND OVERWINTERS IN THE EGG STAGE. THERE ARE APPARENTLY FOUR FEEDING MALE LARVAL INSTARS AND FIVE FEMALE INSTARS. COCOON MEASUREMENTS PROVIDE A FAIRLY RELIABLE MEANS OF SEXING SAWFLY PUPAE. FEMALES PRODUCE AN AVERAGE OF 72 EGGS. PARASITES AND A FUNGUS DISEASE ARE THE MOST IMPORTANT NATURAL CONTROL FACTORS.

HARRIS, A. S. 10 68098
RIPENING AND DISPERSAL OF THE 1966-67 WESTERN HEMLOCK-SITKA SPRUCE SEED CROP IN SOUTHEAST ALASKA. (ABSTR.)
IN 'PROGRAM AND ABSTRACTS.' NINETEENTH ALASKAN SCI. CONF. 1968, P. 32. (NO COPIES AVAILABLE)

HARRIS, A. S. 2 68020
SMALL MAMMALS AND NATURAL REFORESTATION IN SOUTHEAST ALASKA.
U.S. FOREST SERV. RES. NOTE PNW-75, 7 PP., ILLUS.
DESCRIBES BIANNUAL SMALL-MAMMAL CENSUSES MADE ON A CUTOVER AND A TIMBERED PLOT OVER A 9-YEAR PERIOD IN MAYBESO VALLEY NEAR HOLLIS, PRINCE OF WALES ISLAND, ALASKA. ADEQUATE NATURAL CONIFER REGENERATION WAS OBTAINED ON THE CUTTING DESPITE THE PRESENCE OF SMALL MAMMALS.

HARRIS, A.S. 12 67146
NATURAL REFORESTATION ON A MILE-SQUARE CLEARCUT IN SOUTHEAST ALASKA.
U.S. FOREST SERV. RES. PAP. PNW-52, 16 PP., ILLUS.
NATURAL REFORESTATION ON A 700-ACRE LOGGING UNIT OF THE MAYBESO EXPERIMENTAL FOREST, PRINCE OF WALES ISLAND, ALASKA, WAS STUDIED DURING 9 YEARS BEGINNING WITH CLEARCUTTING OF THE OLD-GROWTH WESTERN HEMLOCK-SITKA SPRUCE STAND. PRODUCTION AND DISSEMINATION OF SEED AND ESTABLISHMENT, DEVELOPMENT, AND SPECIES COMPOSITION OF TREE REPRODUCTION ARE DISCUSSED.

HARVEY, GEORGE M., AND WRIGHT, KENNETH H. 09 68078
GUIDELINES FOR SALVAGING BEETLE-KILLED DOUGLAS FIR.
FOREST IND. 95(10), PP. 52-54, ILLUS. (NO COPIES AVAILABLE)
PROMPT SALVAGE OF BEETLE-KILLED DOUGLAS-FIR TIMBER ACHIEVES MAXIMUM VALUE RECOVERY. SERIOUS DECAY LOSS OCCURS IN SECOND-GROWTH TIMBER BY 3 YEARS AFTER DEATH, AND DETERIORATION IS ESSENTIALLY COMPLETE BY 7 YEARS. IN OLD-GROWTH TIMBER, EXTENSIVE DECAY OCCURS BY 7 YEARS, AND EXCEPT IN VERY LARGE TREES DETERIORATION IS ESSENTIALLY COMPLETE BY 9 TO 11 YEARS.

HELMERS, A. E. 6 68055
A VERSATILE, GAS-OPERATED WATER-LEVEL RECORDER.
WATER RESOURCES RES. 4, PP. 619-623, ILLUS.
RECORDER THAT SENSES PRESSURE AS GAS IS BUBBLED FREELY THROUGH DEPTHS OF WATER HAS BEEN USED FOR RECORDING WATER LEVELS IN PIEZOMETERS AND STORAGE PRECIPITATION GAGES. PARTS AND MATERIALS COST LESS THAN $200.

HENDEE, JOHN C., AND *CATTON, WILLIAM R., JR. # 9 68077
WILDERNESS USERS... WHAT DO THEY THINK.
AMER. FORESTS 74(9), PP. 29-31, 60-61, ILLUS.
WILDERNESS MANAGEMENT IS RESTRICTED BY LEGISLATION AND ECOLOGICAL REALITIES BUT THE REACTION OF USERS TO ALTERNATIVE MANAGEMENT POLICIES IS NEVERTHELESS IMPORTANT. THIS ARTICLE SUMMARIZES MANAGEMENT PREFERENCES AND CHARACTERISTICS AND THEIR IMPLICATIONS.
AUTHORS' NAMES ERRONEOUSLY REVERSED IN AMERICAN FORESTS.

HENDEE, JOHN C., *CATTON, WILLIAM R., JR., 12 68150
*MARLOW, LARRY D., AND *BROCKMAN, C. FRANK.
WILDERNESS USERS IN THE PACIFIC NORTHWEST--THEIR CHARACTERISTICS, VALUES, AND MANAGEMENT PREFERENCES.
U.S.D.A. FOREST SERV. RES. PAP. PNW-61, 92 PP., ILLUS.
WILDERNESS VISITATION TYPICALLY OCCURS IN MORE HIGHLY EDUCATED, SMALL FAMILY AND FRIENDSHIP GROUPS WHO TAKE ABOUT FIVE 2- TO 3-DAY TRIPS PER YEAR. ABOUT 30 PERCENT (400) BELONGED TO 218 CONSERVATION GROUPS. THOSE WHO WERE MORE WILDERNESS PURIST IN ATTITUDE REACTED DIFFERENTLY TO SOME OF THE STATEMENTS--53 ON WILDERNESS MANAGEMENT AND 22 ON CODES OF BEHAVIOR--SUGGESTED IN THE QUESTIONNAIRE.

HENDEE, JOHN C., AND *MILLS, ARCHIE. 10 68094
ENCHANTMENT WILDERNESS--MANAGEMENT TO PRESERVE WILDERNESS VALUES.
THE LIVING WILDERNESS 32(101), PP. 14-20, ILLUS.
SOME MODIFICATION OF ACCEPTED WILDERNESS MANAGEMENT PRACTICES IS RECOMMENDED FOR THE PROPOSED ENCHANTMENT WILDERNESS.

HERMAN, FRANCIS R., *DEMARS, DONALD J., AND 02 68014
*LAURITSEN, DONALD A.
STEM ANALYSIS TECHNIQUES FOR UPPER-SLOPE CONIFERS IN THE CASCADE RANGE. (ABSTR.)
NORTHWEST SCI. 42, P. 34. (NO COPIES AVAILABLE)

HERRING, H. G. 2 68012
SOIL-MOISTURE DEPLETION BY A CENTRAL WASHINGTON LODGEPOLE PINE STAND.
NORTHWEST SCI. 42, PP. 1-4, ILLUS.
SOIL MOISTURE UNDER A LODGEPOLE PINE STAND HAS BEEN MEASURED AT BIWEEKLY INTERVALS THROUGHOUT THE GROWING SEASON FOR 4 CONSECUTIVE YEARS. DATA ARE PESENTED TO SHOW THE SUMMER SOIL MOISTURE REGIME BOTH BEFORE AND AFTER THE TREES WERE REMOVED.

KRUEGER, KENNETH W. 7 68072
INVESTIGATIONS OF SHINGLE TOW PACKING MATERIAL FOR CONIFER SEEDLINGS.
U.S.D.A. FOREST SERV. RES. PAP. PNW-63, 10 PP., ILLUS.
WESTERN REDCEDAR SHINGLE TOW IS USED EXTENSIVELY IN FOREST NURSERIES TO KEEP SEEDLING ROOTS MOIST DURING STORAGE AND SHIPMENT. CHEMICAL COMPOUNDS FROM THE WOOD WERE TOXIC TO DOUGLAS-FIR SEEDLINGS. CONDITIONS INFLUENCING AVAILABILITY OF THESE CHEMICALS FROM SHINGLE TOW, THEIR UPTAKE BY SEEDLINGS, AND MORTALITY THAT MAY ENSUE ARE REPORTED AND DISCUSSED.

KRUEGER, KENNETH W., AND RUTH, ROBERT H. 12 68130
PHOTOSYNTHESIS OF RED ALDER, DOUGLAS-FIR, SITKA SPRUCE, AND WESTERN HEMLOCK SEEDLINGS. (ABSTR.)
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, P. 239.

KRUEGER, KENNETH W., AND TSUDA, ALBERT H. 11 68117
BUD BREAK OF DOUGLAS-FIR SEEDLINGS NOT DELAYED BY SPRING TREATMENT WITH TMTD OR ALAR.
TREE PLANTERS' NOTES 19(3), PP. 11-12.
THE LIFTING AND PLANTING SEASON COULD BE EXTENDED BY DELAYING BUD BREAK OF NURSERY STOCK. TO TEST SUGGESTIONS THAT TMTD RABBIT REPELLENT DELAYED BUD BREAK, SEEDLING TOPS WERE DIPPED INTO FORMULATIONS OF 2.5- AND 5-PERCENT TMTD, WITH AND WITHOUT ADHESIVE, AND OF ALAR (0.4 PERCENT ACID BY WEIGHT) IN SPRING 1966. NONE OF THE TREATMENTS TESTED SIGNIFICANTLY DELAYED SEEDLING BUD BREAK.

*LEJEUNE, R. R. AND CAROLIN, V. M. 12 67159
BLACK-HEADED BUDWORM 'ACLERIS VARIANA' (FERNALD).
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 67-69, ILLUS. (NO COPIES AVAILABLE)
INFORMATION IS GIVEN ON DISTRIBUTION, HOSTS, DAMAGE, LIFE HISTORY, AND CONTROL MEASURES. RESEARCH IS NEEDED FOR A BETTER UNDERSTANDING OF EPIDEMIOLOGY OF THIS SPECIES AND DELINEATION OF HIGH- AND LOW-HAZARD AREAS.

LEVITAN, JACK. 1 68018
SHOULD LOG SCALE BE REDUCED FOR KNOTS.
U.S. FOREST SERV. RES. NOTE PNW-73, 14 PP., ILLUS.
COMPARES LUMBER RECOVERY FROM LOGS SCALED AS ROUGH WITH LOGS HAVING NO SCALE DEDUCTIONS. DIFFERENCES IN RECOVERY ARE DISCUSSED WITH REGARD TO THEIR PROBABLE CAUSES, AND RECOMMENDATIONS FOR THE APPLICATION OF THIS INFORMATION TO PRESENT SCALING PRACTICES ARE MADE.

*LI, C. Y., LU, K. C., TRAPPE, J. M., AND BOLLEN, W. B. 5 68036
ENZYME NITRATE REDUCTASE OF SOME PARASITIC FUNGI.
U.S. FOREST SERV. RES. NOTE PNW-79, 4 PP.
TESTS OF THE FUNGI AFTER 2 WEEKS' AEROBIC GROWTH IN PURE CULTURE WERE NEGATIVE FOR 'PORIA WEIRII' AND POSITIVE FOR 'PYTHIUM DEBARYANUM,' 'PHYTOPHTHORA CINNAMOMI,' 'NEUROSPORA CRASSA,' 'FUSARIUM OXYSPORUM,' 'FUSARIUM AVENACEUM,' 'GLIOCLADIUM ROSEUM,' 'TRICHOTHECIUM ROSEUM, AND 'VERTICILLIUM ALBOATRUM.'

*LI, C. Y., LU, K. C., TRAPPE, J. M., AND BOLLEN, W. B. 12 68131
ENZYME SYSTEMS OF RED ALDER AND DOUGLAS-FIR IN RELATION TO INFECTION BY 'PORIA WEIRII'.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 241-250, ILLUS.
PRESENCE OF PHENOLOXIDASES IN TISSUE OF RED ALDER BUT ABSENCE IN DOUGLAS-FIR APPEARS TO ACCOUNT FOR THE ALDER'S RESISTANCE TO INFECTION BY 'PORIA WEIRII'. HIGH PEROXIDASE ACTIVITY IN ALDER AS COMPARED TO DOUGLAS-FIR MAY ALSO CONTRIBUTE TO ALDER'S RESISTANCE TO THE ROOT DISEASE.

*LONGHURST, W. M., *OH, H. K., *JONES, M. B., AND *KEPNER, R. E. 12 68125
A BASIS FOR THE PALATABILITY OF DEER FORAGE PLANTS.
THIRTY-THIRD N. AMER. WILDLIFE AND NATUR. RESOURCES CONF. TRANS. 1968, PP. 181-189. (NO COPIES AVAILABLE)
THE RELATIONSHIP BETWEEN FORAGE PALATABILITY AND COMPATABILITY WITH RUMEN MICROBES IS DISCUSSED. LEAST PALATABLE PLANTS TEND TO BE MOST INHIBITORY ON BACTERIAL GROWTH. THE RELATIVE ABILITIES OF DEER AND SHEEP TO DIGEST GRASS AND BROWSE WAS ASSOCIATED WITH THEIR RELATIVE PREFERENCES FOR THESE KINDS OF FORAGE. IT IS SUGGESTED THAT PLANTS HAVE DEVELOPED PHYSIOLOGICAL DEFENSE MECHANISMS THROUGH THE ACCUMULATION OF COMPUNDS WHICH INHIBIT DIGESTION BY RUMEN BACTERIA.

LOPUSHINSKY, WILLIAM. 02 68016
STOMATAL RESPONSE OF CONIFER SEEDLINGS TO LEAF WATER STRESS. (ABSTR.)
NORTHWEST SCI. 42, P. 38. (NO COPIES AVAILABLE)

LU, K. C., *CHEN, C. S., AND *BOLLEN, W. B. 12 68138
COMPARISON OF MICROBIAL POPULATIONS BETWEEN RED ALDER AND CONIFER SOILS.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 173-178, ILLUS.
ALL ORGANISMS WERE GENERALLY MORE NUMEROUS IN THE F LAYER THAN IN THE A11 HORIZON. POPULATIONS OF MOLDS WERE LOWEST IN SPRING, WHEN THE SOIL WAS EXTREMELY WET. IN THE F LAYER, 'STREPTOMYCES' SPECIES, POSSIBLE ANTAGONISTS OF ROOT PATHOGENS, CONSISTENTLY COMPRISED A HIGHER PROPORTION OF THE TOTAL BACTERIAL POPULATION OF THE MIXED STAND THAN OF EITHER PURE ALDER OR PURE CONIFER STANDS.

LUND, H. GYDE. 11 68101
AN AZIMUTH CONVERTER.
J. FOREST. 66, P. 854, ILLUS.
EXPLAINS HOW TO MAKE AN AZIMUTH CONVERTER, AND SUGGESTS SOME USES TO WHICH IT MAY BE PUT.

*MAKI, WILBUR R., SCHALLAU, CON H., AND REUTER, JOHN H. 4 68029
IMPORTANCE OF TIMBER-BASED EMPLOYMENT TO THE ECONOMIC BASE OF THE DOUGLAS-FIR REGION OF OREGON, WASHINGTON, AND NORTHERN CALIFORNIA.
U.S. FOREST SERV. RES. NOTE PNW-76, 6 PP., ILLUS.
DEPENDENCY, MEASURED IN TERMS OF THE PERCENT OF ECONOMIC (OR EXPORT) BASE EMPLOYMENT ACCOUNTED FOR BY TIMBER-DEPENDENT INDUSTRIES, RANGED FROM 6.2 PERCENT FOR THE SEATTLE ECONOMIC AREA TO 99.4 PERCENT FOR THE ROSEBURG AREA.

MARTIGNONI, MAURO E. 03 68152
BOOK REVIEW OF 'THE DICTIONARY OF THE BIOLOGICAL SCIENCES,' BY PETER GRAY.
J. INVERTEBRATE PATHOL. 10, PP. 458-459. (NO COPIES AVAILABLE)

MARTIGNONI, MAURO E., *BREILLATT, JULIAN P., AND *ANDERSON, NORMAN G. 09 68148
MASS PURIFICATION OF POLYHEDRAL INCLUSION BODIES BY ISOPYCNIC BANDING IN ZONAL ROTORS.
J. INVERTEBRATE PATHOL. 11, PP. 507-510, ILLUS.
A NEW METHOD FOR THE PURIFICATION OF VIRAL NUCLEOPOLYHEDRA FROM DOUGLAS-FIR TUSSOCK MOTH LARVAE IS DESCRIBED. BY MEANS OF B-XV AND B-XXIII ROTORS, DEVELOPED AT THE OAK RIDGE NATIONAL LABORATORY, VIRAL INCLUSIONS CAN BE OBTAINED FREE OF BACTERIAL CONTAMINANTS.

MARTIGNONI, MAURO E., AND IWAI, PAUL J. 08 68103
DETERMINATION OF NUCLEOPOLYHEDRON COUNTS AND SIZE FREQUENCY DISTRIBUTIONS BY MEANS OF A COULTER TRANSDUCER.
U.S.D.A. FOREST SERV. RES. NOTE PNW-85, 14 PP., ILLUS.
A COULTER COUNTER, MODEL B, WITH UPPER AND LOWER THRESHOLD DISCRIMINATORS AND A 30-MICRON APERTURE TUBE, CAN BE USED FOR THE ENUMERATION OF NUCLEOPOLYHEDRA IN SUSPENSIONS--EITHER PURE OR WITH VARYING AMOUNTS OF IMPURITIES, ALSO CAN ESTABLISH SIZE FREQUENCY DISTRIBUTIONS OF VIRAL INCLUSION BODIES. PROCEDURES ARE DESCRIBED IN DETAIL AND ILLUSTRATED.

MCCONNELL, BURT R. 06 68058
ESTIMATING DEER AND ELK PELLET GROUP DENSITY FROM FREQUENCY COUNTS.
IN 'WESTERN PROCEEDINGS.' FORTY-SEVENTH ANNU CONF. WEST. ASS. STATE GAME AND FISH COMM., 1967, PP. 159-167. (NO COPIES AVAILABLE)
THE DISPERSION OF DEER AND ELK PELLET GROUPS WAS DETERMINED ON SEVEN UNIFORM AREAS AND RANDOM DISTRIBUTIONS WERE FOUND ON ALL AREAS BUT ONE. ON THE AREAS WITH RANDOM DISTRIBUTIONS, THE MATHEMATICAL RELATIONSHIP BETWEEN FREQUENCY AND DENSITY WAS USED TO CALCULATE THE EXPECTED NUMBERS OF GROUPS FROM THEIR PRESENCE OR ABSENCE ON SAMPLE PLOTS.

*MEAD, WALTER J., AND HAMILTON, THOMAS E. 12 68155
COMPETITION FOR FEDERAL TIMBER IN THE PACIFIC NORTHWEST--AN ANALYSIS OF FOREST SERVICE AND BUREAU OF LAND MANAGEMENT TIMBER SALES.
U.S.D.A. FOREST SERV. RES. PAP. PNW-64, 63 PP., ILLUS.
FOREST SERVICE AND BUREAU OF LAND MANAGEMENT TIMBER SALES IN OREGON AND WASHINGTON SHOWED THAT COMPETITION, DEFINED AS THE RATIO BETWEEN BID PRICE AND APPRAISED PRICE, WAS SIGNIFICANTLY AFFECTED BY NUMBER OF BIDDERS, SIZE OF PURCHASER, SALE SIZE AND ROAD CONSTRUCTION REQUIREMENTS, AND THE SIZE OF THE AVERAGE APPRAISED PRICE. LUMBER PRICES AND THE LEVEL OF HOUSING STARTS WERE FOUND TO BE IMPORTANT IN EXPLAINING THE SIZE OF THE BID-APPRAISAL RATIO.

MINER, NORMAN H. 09 68145
NATURAL FILTERING OF SUSPENDED SOIL BY A STREAM AT LOW FLOW.
U.S.D.A. FOREST SERV. RES. NOTE PNW-88, 4 PP., ILLUS.
DURING ROAD CONSTRUCTION, SOIL THAT IS ADDED TO A STREAM BY TRACTORS CROSSING DURING LOW FLOW IS TEMPORARILY 'FILTERED' OUT BEFORE IT TRAVELS FAR. THIS FILTRATION IS TEMPORARY AND DEPOSITED SOIL WILL TEND TO BE FLUSHED DOWNSTREAM DURING HIGH FLOWS AND MAY CAUSE CHANNEL EROSION OR OTHER DAMAGE.

MINORE, DON 10 68153
EFFECTS OF ARTIFICIAL FLOODING ON SEEDLING SURVIVAL AND GROWTH OF SIX NORTHWESTERN TREE SPECIES.
U.S.D.A. FOREST SERV. RES. NOTE PNW-92, 12 PP., ILLUS.
SEEDLINGS OF SIX COASTAL SPECIES WERE FLOODED IN BOTH WINTER AND SUMMER. SUMMER FLOODING WAS MORE DAMAGING THAN WINTER FLOODING. WESTERN REDCEDAR AND LODGEPOLE PINE SEEMED TO BE MOST FLOOD TOLERANT. RED ALDER, SITKA SPRUCE, AND WESTERN HEMLOCK SEEMED TO BE MODERATELY TOLERANT. DOUGLAS-FIR WAS VERY INTOLERANT.

*MORTON, W. MARK, AND CROUCH, GLENN L. 08 68111
POSSIBLE CONTAMINATION OF THE SILVIES RIVER FOLLOWING AN ACCIDENTAL LOSS OF DDT. (ABSTR.)
IN 'SURVEILLANCE REPORT 1965 BURNS PROJECT DOUGLAS-FIR TUSSOCK MOTH CONTROL.' PP. 13-14. (COPIES AVAILABLE ONLY FROM DIV. OF TIMBER MANAGEMENT, U.S.D.A. FOREST SERV., PACIFIC NORTHWEST REGION, PORTLAND, OREG.)

*NEAL, J. L., JR., LU, K. C., BOLLEN, W. B., AND TRAPPE, J. M. 12 68132
A COMPARISON OF RHIZOSPHERE MICROFLORAS ASSOCIATED WITH MYCORRHIZAE OF RED ALDER AND DOUGLAS-FIR.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 57-71, ILLUS.
MICROBIAL POPULATIONS AND AMMONIFYING AND NITRATE-REDUCING MICROBES DIFFERED QUANTITATIVELY AND QUALITA-

TIVELY BETWEEN TWO MICROHABITATS. RESPIRATION OF NON-RHIZOSPHERE MICROBES WAS STIMULATED BY DOUGLAS-FIR NONMYCORRHIZAL ROOT AND RED ALDER MYCORRHIZAL ROOT SUSPENSIONS. APPARENTLY AN INHIBITORY SUBSTANCE IN DOUGLAS-FIR MYCORRHIZAL ROOTS AND RED ALDER NONMYCORRHIZAL ROOTS SUPPRESSED GLUCOSE OXIDATION.

*NEAL, J. L., JR., TRAPPE, J. M., LU, K. C., AND BOLLEN, W. B. 12 68137
SOME ECTOTROPHIC MYCORRHIZAE OF 'ALNUS RUBRA'.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 179-184, ILLUS.
TWO FORMS OF MYCORRHIZAE PREDOMINATED ON ROOT SYSTEMS OF RED ALDER ('ALNUS RUBRA' BONG.) IN A PURE STAND NEAR THE OREGON COAST. DETAILED MORPHOLOGICAL STUDIES, THE FIRST FOR THIS SPECIES, REVEALED DISTINCT CHARACTERISTIC DIFFERENCES BETWEEN THE FUNGAL SYMBIONTS. THE GREAT ABUNDANCE OF THESE MYCORRHIZAE AND THEIR IMMEDIATE INFLUENCE ON RHIZOSPHERE MICROBES COULD MARKEDLY AFFECT THE INCIDENCE OF ROOT DISEASE.

NELSON, EARL E. 7 68063
SURVIVAL OF 'PORIA WEIRII' IN CONIFER, ALDER, AND MIXED CONIFER-ALDER STANDS.
U.S.D.A. FOREST SERV. RES. NOTE PNW-83, 5 PP., ILLUS.
A PRELIMINARY STUDY CONDUCTED NEAR THE OREGON COAST INDICATES A POSSIBLE ROLE OF RED ALDER IN BIOLOGICAL CONTROL OF 'PORIA WEIRII.' THE FUNGUS IN SMALL WOOD CUBES SURVIVED FOR A SHORTER PERIOD BURIED UNDER STANDS CONTAINING RED ALDER THAN UNDER THOSE OF PURE CONIFERS.

*NORRIS, LOGAN A. 3 68027
RECOVERY OF AMITROLE FROM FOREST LITTER.
IN 'RESEARCH PROGRESS REPORT,' WEST. SOC. WEED SCI., PP. 31-32
THE AMOUNT OF AMITROLE HERBICIDE RECOVERABLE FROM FOREST FLOOR MATERIAL DECREASES RAPIDLY THE FIRST FIVE DAYS AFTER THE CHEMICAL IS APPLIED. SUCH LOSS MAY BE DUE TO CHEMICAL DEGRADATION, COMPLEXING WITH METAL IONS, ADSORPTION, OR ANY COMBINATION OF THESE THREE ACTIONS.

*NORRIS, LOGAN A. 3 68028
STREAM CONTAMINATION BY HERBICIDES AFTER FALL RAINS ON FOREST LAND.
IN 'RESEARCH PROGRESS REPORT,' WEST. SOC. WEED SCI., PP. 33-34.
FALL RAINS DID NOT INTRODUCE MEASURABLE AMOUNTS (1 PPB SENSITIVITY) OF 2,4-D OR 2,4,5-T INTO TWO COASTAL OREGON STREAMS, THE WATERSHEDS OF WHICH HAD BEEN TREATED WITH HERBICIDES THE PREVIOUS SPRING.

*OH, HI KON, *JONES, M. B., AND *LONGHURST, W. M. 01 68026
COMPARISON OF RUMEN MICROBIAL INHIBITION RESULTING FROM VARIOUS ESSENTIAL OILS ISOLATED FROM RELATIVELY UNPALATABLE PLANT SPECIES.
APPL. MICROBIOL. 16, PP. 39-44. (NO COPIES AVAILABLE)
THE INHIBITORY POTENCY OF ESSENTIAL OILS UPON DEER AND SHEEP MICRO-ORGANISMS WAS COMPARED, IN TERMS OF TOTAL GAS AND VOLATILE FATTY ACID PRODUCTION, BY ANAEROBIC MANOMETRIC TECHNIQUES. THE EIGHT SPECIES TESTED WERE RANKED IN FOUR GROUPS BASED UPON THE DEGREE OF MICROBIAL INHIBITION PRODUCED.

*OH, HI KON, *SAKAI, T., *JONES, M. B., AND *LONGHURST, W. M. 07 67148
EFFECT OF VARIOUS ESSENTIAL OILS ISOLATED FROM DOUGLAS FIR NEEDLES UPON SHEEP AND DEER RUMEN MICROBIAL ACTIVITY.
APPL. MICROBIOL. 15, PP. 777-784, ILLUS. (NO COPIES AVAILABLE)
IN TESTS BY ANAEROBIC MANOMETRIC TECHNIQUES, THERE WERE MARKED DIFFERENCES IN RESPONSES OF DEER AND SHEEP RUMEN MICROBES TO THE VARIOUS ESSENTIAL OILS. RUMEN MICROBES OF DEER COLLECTED IN DOUGLAS-FIR FORESTS WERE AFFECTED LESS THAN THOSE WITH NO ACCESS TO DOUGLAS-FIR.

OSWALD, DANIEL D. 12 67155
FOREST SURVEY TECHNIQUES.
UNIV. OF CALIF. YOUNG-GROWTH FOREST MANAGEMENT IN CALIFORNIA PROC. 1967, PP. 139-140. (NO COPIES AVAILABLE)

OSWALD, DANIEL D. 3 68011
PRELIMINARY TIMBER RESOURCE STATISTICS FOR HUMBOLDT COUNTY, CALIFORNIA, JANUARY 1, 1967.
U.S. FOREST SERV. RESOURCE BULL. PNW-23, 8 PP.
SUMMARIZES PRELIMINARY FINDINGS OF AN INVENTORY OF HUMBOLDT COUNTY'S TIMBER RESOURCES COMPLETED IN 1966.

OSWALD, DANIEL D. 9 68088
THE TIMBER RESOURCES OF HUMBOLDT COUNTY, CALIFORNIA.
U.S.D.A. FOREST SERV. RESOURCE BULL. PNW-26, 42 PP.
THIS REPORT PRESENTS THE FIRST COMPLETE INVENTORY OF HUMBOLDT COUNTY'S TIMBER RESOURCES. THE FIELD DATA WERE COLLECTED IN 1966. ACCOMPANYING THE 28 TABLES OF DETAILED FOREST AREA, VOLUME, AND OWNERSHIP STATISTICS FOR HUMBOLDT COUNTY IS AN ANALYSIS OF THE PRESENT TIMBER RESOURCE AND THE PROBLEMS THAT AFFECT PRESENT AND FUTURE TIMBER PRODUCTION.

OSWALD, DANIEL D. 12 67154
YOUNG-GROWTH INVENTORY DATA.
UNIV. OF CALIF. YOUNG-GROWTH FOREST MANAGEMENT IN CALIFORNIA PROC. 1967, PP. 1-3. (NO COPIES AVAILABLE)

OVIATT, ALFRED E., JR. 12 68149
MOISTURE CONTENT OF GLULAM TIMBERS IN USE IN THE PACIFIC NORTHWEST.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 21 PP., ILLUS.
AN INITIAL REPORT ON A STUDY OF MOISTURE CONTENTS IN INTERIOR AND EXTERIOR GLULAM MEMBERS UNDER A VARIETY OF USE ENVIRONMENTS IN WESTERN WASHINGTON AND OREGON. PART OF A NATIONAL STUDY CONDUCTED BY THE U.S.D.A. FOREST SERVICE WITH THE COOPERATION OF THE AMERICAN INSTITUTE OF TIMBER CONSTRUCTION. TO PROVIDE DATA USEFUL TO THE TIMBER FABRICATING INDUSTRY IN RECOMMENDING DESIGN STANDARDS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 4 68041
ANIMAL DAMAGE CONTROL.
2 PP., ILLUS.
AN INFORMATION SHEET DESCRIBING LOCATION, STAFF, THE STUDY, COOPERATORS, AND PUBLICATIONS FOR THE PARTICULAR PROJECT DESCRIBED.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 5 68042
ANNOTATED LIST OF PUBLICATIONS OF THE PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION FOR THE YEAR 1967.
8 PP.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 5 68035
ANNUAL REPORT, 1967.
32 PP., ILLUS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 10 68085
BIG-GAME HABITAT.
2 PP., ILLUS.
AN INFORMATION SHEET DESCRIBING LOCATION, STAFF, THE STUDY, COOPERATORS, AND PUBLICATIONS FOR THE PARTICULAR PROJECT DESCRIBED.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 4 68040
INTENSIVE CULTURE OF DOUGLAS-FIR.
2 PP., ILLUS.
AN INFORMATION SHEET DESCRIBING LOCATION, STAFF, THE STUDY, COOPERATORS, AND PUBLICATIONS FOR THE PARTICULAR PROJECT DESCRIBED.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 3 68022
LIST OF AVAILABLE PUBLICATIONS, NO. 1 1968.
2 PP., WITH ANNOTATIONS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 6 68043
LIST OF AVAILABLE PUBLICATIONS, NO. 2 1968.
2 PP., WITH ANNOTATIONS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 8 68069
LIST OF AVAILABLE PUBLICATIONS, NO. 3 1968.
2 PP., WITH ANNOTATIONS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 10 68096
LIST OF AVAILABLE PUBLICATIONS, NO. 4 1968.
2 PP., WITH ANNOTATIONS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 12 68120
LIST OF AVAILABLE PUBLICATIONS, NO . 5 1968.
3 PP., WITH ANNOTATIONS.

PACIFIC NORTHWEST FOREST AND RANGE EXP. STA. 10 68086
RANGE ECOLOGY AND MANAGEMENT.
2 PP., ILLUS.
AN INFORMATION SHEET DESCRIBING LOCATION, STAFF, THE STUDY, COOPERATORS, AND PUBLICATIONS FOR THE PARTICULAR PROJECT DESCRIBED.

PATRIC, JAMES H., AND *BLACK, PETER E. 12 68156
POTENTIAL EVAPOTRANSPIRATION AND CLIMATE IN ALASKA BY THORNTHWAITE'S CLASSIFICATION.
U.S.D.A. FOREST SERV. RES. PAP. PNW-71, 28 PP., ILLUS.
ESTIMATES AND MEASUREMENTS OF POTENTIAL EVAPOTRANSPIRATION (PET) BY THORNTHWAITE'S METHODS SHOWED GOOD AGREEMENT WITH ESTIMATES AND MEASUREMENTS BY OTHER METHODS. NATURAL VEGETATION IS CLOSELY RELATED TO CLIMATE. VEGETATION DISTRIBUTION IN THE INTERIOR SEEMS GOVERNED MORE BY TEMPERATURE THAN BY MOISTURE AVAILABILITY. THE AVAILABLE DATA HEAVILY BIAS CLASSIFICATIONS OF CLIMATE TO SEA-LEVEL AND VALLEY-BOTTOM CONDITIONS.

PATRIC, J. H., AND STEPHENS, F. R. 09 68118
SOIL-MOISTURE LEVELS IN SOME REPRESENTATIVE SOILS NEAR JUNEAU, ALASKA.
SOIL SCI. 106, PP. 172-176, ILLUS.
MOISTURE CONTENT OF FOREST SOILS NEAR JUNEAU, ALASKA, WAS MEASURED WITH TENSIOMETERS DURING THE 1966 GROWING SEASON. SUGGESTS THAT FORESTS IN SOUTHEAST ALASKA RARELY, IF EVER, EXPERIENCE DAMAGING SOIL-MOISTURE DEFICITS.

PATRIC, J. H., AND SWANSTON, D. N. 1 68004
HYDROLOGY OF A SLIDE-PRONE GLACIAL TILL SOIL IN SOUTHEAST ALASKA.
J. FOREST. 66, PP. 62-66, ILLUS.
THE HYDROLOGY OF A SLIDE-PRONE GLACIAL TILL SOIL AND ITS EFFECT ON SOIL STABILITY ARE DISCUSSED IN TERMS OF MEASURED RAINFALL, STREAMFLOW, AND PIEZOMETRIC HEAD. INTERPRETATION OF SOIL WATER FLOW USING DARCY'S EQUATION SHOWS HOW THIS SOIL CAN ACCOMMODATE LARGE AMOUNTS OF WATER BUT UNDER THE RIGHT SLOPE CONDITIONS DISPLAY TOTAL SATURATION AND MAXIMUM INSTABILITY.

*PECHANEC, ANNA A., AND FRANKLIN, JERRY F. 12 68133
COMPARISON OF VEGETATION IN ADJACENT ALDER, CONIFER, AND MIXED ALDER-CONIFER COMMUNITIES II. EPIPHYTIC, EPIXYLIC, AND EPILITHIC CRYPTOGAMS.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 85-98, ILLUS.
EPIPHYTIC AND EPIXYLIC CRYPTOGAMS WERE COMPARED IN ADJACENT RED ALDER, CONIFER, AND MIXED ALDER-CONIFER COMMUNITIES. TWENTY-FOUR EPIPHYTIC SPECIES WERE ENCOUNTERED. RED ALDER WAS A MORE FAVORABLE HOST THAN DOUGLAS-FIR OR SITKA SPRUCE IN TERMS OF NUMBER OF EPIPHYTIC CRYPTOGAMS AND THEIR FREQUENCY AND COVERAGE. MOSSES WERE REPRESENTED BEST ON TREE BASES, LIVERWORTS, ON MID-PORTIONS OF TREE TRUNKS, AND LICHENS, ON UPPER TRUNKS AND IN CROWNS. THIRTEEN SPECIES OF EPIXYLIC CRYPTOGAMS WERE ENCOUNTERED DURING SAMPLING OF ROTTEN LOGS.

*PREBBLE, M. L. AND CAROLIN, V. M. 12 67161
SPRUCE BUDWORM 'CHORISTONEURA FUMIFERANA' (CLEM.).
IN 'IMPORTANT FOREST INSECTS AND DISEASES OF MUTUAL CONCERN TO CANADA, THE UNITED STATES AND MEXICO.' CAN. DEP. FOREST. AND RURAL DEVELOP. PUB. NO. 1180, PP. 75-80, ILLUS. (NO COPIES AVAILABLE)
INFORMATION IS GIVEN ON DISTRIBUTION, HOSTS, DAMAGE, LIFE HISTORY AND CONTROL MEASURES. THE PROBLEM OF CONTROL IS DESCRIBED BY PRESENTATION OF CONTROL CONCEPTS AND LISTING OF NEEDS FOR ADDITIONAL RESEARCH.

RADWAN, M. A. 06 68053
EFFECT OF CHEMICAL COMPOSITION ON BEARS' PREFERENCE FOR SAPWOOD OF SOME TREE SPECIES. (ABSTR.)
TWENTY-THIRD NORTHWEST REG. AMER. CHEM. SOC. MEETING, ABSTRACTS SECT. 23-136. (NO COPIES AVAILABLE)

RADWAN, M. A. 11 68106
EFFECTS OF STORAGE ON ENDRIN-TREATED DOUGLAS FIR SEED. (ABSTR.)
IN 'ABSTRACTS OF PRESENTED PAPERS.' WEST. FOREST GENETICS ASS. ANN. MTG. 1968, P. 3. (NO COPIES AVAILABLE)

RADWAN, M. A., AND *CAMPBELL, D. L. 1 68019
SNOWSHOE HARE PREFERENCE FOR SPOTTED CATSEAR FLOWERS IN WESTERN WASHINGTON.
J. WILDLIFE MANAGE. 32, PP. 104-108, ILLUS.
THE HARES DEMONSTRATED PREFERENCE FOR OPEN FLOWERS, FOLLOWED CLOSELY BY FLOWER BUDS. LEAVES WERE THE LEAST PREFERRED PART OF THE PLANT. BASED ON FRESH WEIGHTS, LEVELS OF SUGARS APPEARED TO BE RESPONSIBLE FOR THE OBSERVED ORDER OF PREFERENCE.

*REDISKE, J. H., *GAUDITZ, ILLO, AND CAMPBELL, R. K. 08 68157
FAMILY RESPONSE TO LEVELS OF FERTILIZER. (ABSTR.)
WEST. FOREST GENET. ASS. MEET. 1968, P. 13. (NO COPIES AVAILABLE)
SIXTEEN FAMILIES, REPLICATED 16 TIMES, WERE EVALUATED FOR RESPONSE TO FERTILIZER WHEN GROWN IN 50 ML TUBES UNDER FOUR FERTILIZER LEVELS. SOME FAMILIES RESPONDED SIGNIFICANTLY BETTER THAN OTHERS TO INCREASED FERTILITY AND SOME PHOTOSYNTHESIZED MORE EFFICIENTLY.

REUKEMA, DONALD L. 08 68105
GROWTH RESPONSE OF 35-YEAR-OLD, SITE V DOUGLAS-FIR TO NITROGEN FERTILIZER.
U.S.D.A. FOREST SERV. RES. NOTE PNW-86, 9 PP., ILLUS.
DURING THE FIRST 4 YEARS FOLLOWING APPLICATION, ADDITION OF 200 TO 600 POUNDS OF NITROGEN PER ACRE INCREASED TREE GROWTH SUBSTANTIALLY. HOWEVER, HEAVIER APPLICATIONS ALSO INCREASED AMOUNT OF SNOWBREAKAGE SO NET PRODUCTION TENDED TO BE GREATEST WITH THE ADDITION OF 200 POUNDS PER ACRE.

*RICARD, JACQUES L., AND BOLLEN, WALTER B. 05 68050
INHIBITION OF 'PORIA CARBONICA' BY 'SCYTALIDIUM' SP., AN IMPERFECT FUNGUS ISOLATED FROM DOUGLAS-FIR POLES.
CAN. J. BOT. 46, PP. 643-647, ILLUS. (NO COPIES AVAILABLE)
STRONG ANTAGONISM OF 'SCYTALIDIUM' SP. TO 'P. CARBONICA' ON MALT EXTRACT AGAR WAS ATTRIBUTED AT LEAST PARTLY TO THE PRODUCTION OF AN ANTIBIOTIC SUBSTANCE BY 'SCYTALIDIUM.' THERE WAS NO EVIDENCE OF CHANGE IN MECHANICAL PROPERTIES OF THE WOOD OR OF INJURY TO WOOD CELLS AS A RESULT OF 'SCYTALIDIUM' GROWTH. RESULTS SUGGEST THE POSSIBILITY OF BIOLOGICALLY CONTROLLING DECAY IN STOCK PILES OF PULPWOOD.

*RICARD, J. L., *SEE, T. E., AND BOLLEN, W. B. 04 68033
CONTROL OF INCIPIENT DECAY WITH GASES IN DOUGLAS-FIR POLES.
FOREST PROD. J. 18(4), 45-51, ILLUS. (COPIES AVAILABLE FROM OREGON FOREST RESEARCH LABORATORY, CORVALLIS, OREG.)
A MULTI-GAS DIFFUSION TREATMENT OF DOUGLAS-FIR POLES RESULTS IN SEVERAL REACTIONS THAT SHOULD IMPART A VARIETY OF RESIDUAL FUNGISTATIC AND FUNGICIDAL PROPERTIES TO THE WOOD. CIRCUMVENTION OF THE TREATMENT BY A FUNGAL MUTANT OR ADAPTED FORM OF A WOOD-DESTROYING FUNGUS IS HIGHLY IMPROBABLE.

*RIEKERK, H., AND *GESSEL, S. P. 09 68079
THE MOVEMENT OF DDT IN FOREST SOIL SOLUTIONS.
SOIL SCI. SOC. AMER. PROC. 32, PP. 595-596. (NO COPIES AVAILABLE)
DDT WAS APPLIED TO THE SURFACE OF A GRAVELLY FOREST SOIL AT RATES OF ABOUT 0.5 AND 5 POUNDS PER ACRE. LEACHATES WERE COLLECTED IN TENSION LYSIMETERS. OVER 18 MONTHS, LESS THAN 1 PERCENT OF THE DDT MOVED THROUGH THE SURFACE (15 CM) MINERAL SOIL.

ROTHACHER, JACK. 01 68008
INFLUENCE OF FOREST MANAGEMENT PRACTICES.
IN 'WATER AND ENVIRONMENTAL QUALITY,' OREG. STATE UNIV. WATER RESOURCES RES. INST. SEMINAR (WR 008.67) 1967, PP. 25-31. (NO COPIES AVAILABLE)
TIMBER HARVESTING IN THE FORESTS OF WESTERN OREGON AND WASHINGTON IS AN OPERATION OF SUCH MAGNITUDE THAT IT CANNOT HELP BUT MODIFY THE FOREST ENVIRONMENT AND THE QUANTITY AND QUALITY OF WATER THAT FLOWS FROM IT. THE PROBLEMS INVOLVED, POSSIBLE SOLUTIONS, AND CURRENT PRACTICES DESIGNED TO MINIMIZE UNDESIRABLE CHANGES ARE DISCUSSED.

ROTHACHER, JACK S., AND *GLAZEBROOK, THOMAS B. 8 68075
FLOOD DAMAGE IN THE NATIONAL FORESTS OF REGION 6.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 20 PP., ILLUS.
SUMMARY OF IN-SERVICE REPORTS BY R-6 STORM DAMAGE EVALUATION COMMITTEE EVALUATING FOREST MANAGEMENT PRACTICES RELATED TO DAMAGE FROM STORMS OF DECEMBER 1964 AND JANUARY 1965.

RUTH, ROBERT H. 12 68134
FIRST-SEASON GROWTH OF RED ALDER SEEDLINGS UNDER GRADIENTS IN SOLAR RADIATION.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 99-105, ILLUS.
RED ALDER ('ALNUS RUBRA' BONG.) SEEDLINGS WERE GROWN ON MINERAL SOIL NEAR THE OREGON COAST UNDER A CONIFER STAND THINNED TO PROVIDE GRADIENTS IN CANOPY DENSITY. FIRST-SEASON SURVIVAL WAS ONE SEEDLING PER 31 VIABLE SEEDS SOWN, INDICATING A LOW EFFICIENCY FOR ALDER ESTABLISHMENT COMPARED WITH CONIFERS UNDER SIMILAR CONDITIONS. ONLY A SMALL PART OF VARIATION IN GROWTH WAS ASSOCIATED WITH RADIATION REACHING THE FOREST FLOOR.

RYAN, ROGER B. 9 68090
ELECTRIC BARRIER CONFINEMENT AND COCOONING TRAYS IN REARING THE GREATER WAX MOTH TO FACILITATE RECOVERY OF DECOCOONED PUPAE.
ANN. ENT. SOC. AMER. 61(5), PP. 1341-1342, ILLUS.
MATURE LARVAE OF THE GREATER WAX MOTH, 'GALLERIA MELLONELLA' (L.), WERE HARVESTED FROM REARING JARS, CONFINED FOR COCOONING WITHIN AN ELECTRICALLY CHARGED BARRIER TOGETHER WITH COCOONING TRAYS, AND SUBSEQUENTLY RECOVERED BY DISSOLVING THE COCOONS. REARING DETAILS ARE GIVEN.

*SAKAI, T., *MAARSE, H., *KEPNER, R. E., *JENNINGS, W. G., AND *LONGHURST, W. M. 11 67149
VOLATILE COMPONENTS OF DOUGLAS FIR NEEDLES.
J. AGR. FOOD CHEM. 15(6), PP. 1070-1072, ILLUS. (NO COPIES AVAILABLE)
VOLATILE COMPONENTS ISOLATED FROM DOUGLAS-FIR NEEDLES BY STEAM DISTILLATION AND ETHER EXTRACTION AND SEPARATED BY MEANS OF GAS CHROMATOGRAPHY WERE CHARACTERIZED BY RELATIVE RETENTIONS ON SEVERAL COLUMNS, KOVAT'S INDICES, AND INFRARED SPECTROSCOPY. TWENTY-FOUR COMPOUNDS WERE IDENTIFIED AND INFRARED SPECTRA WERE OBTAINED FOR THREE ALCOHOLS WHICH HAVE NOT YET BEEN IDENTIFIED.

*SCHEIN, EDWARD W. 09 68121
THE INFLUENCE OF DESIGN ON EXPOSED WOOD IN BUILDINGS OF THE PUGET SOUND AREA.
PACIFIC NORTHWEST FOREST AND RANGE EXP. STA., 45 PP., ILLUS.
A DISCUSSION OF DESIGN FACTORS AFFECTING THE SATISFACTORY PERFORMANCE OF EXPOSED TIMBERS IN THE NORTHWEST, BASED UPON A FIELD SURVEY. PROTECTIVE METHODS ARE OUTLINED AND ILLUSTRATED, AND A DESIGN APPROACH IS DEVELOPED TO THE SOLUTION OF WEATHERING PROBLEMS.

SHEA, KEITH R. 12 67144
DISEASE IMPACT ON THE FOREST RESOURCE IN OREGON AND WASHINGTON.
IN 'WESTERN FOREST PEST CONDITIONS.' WEST. FOREST. AND CONSERV. ASS., WEST. FOREST PEST COMM. MEETING 1967, PP. 31-35.
THE TOTAL DISEASE-CAUSED IMPACT IS FROM THREE SOURCES, LOSS OF POTENTIAL GROWTH--162 MILLION CUBIC FEET ANNUALLY, MORTALITY--129 MILLION, AND CULL--112 MILLION OR A TOTAL OF 3.1 BILLION BOARD FEET. THE PRINCIPAL CAUSES OF DISEASE IMPACT--DWARFMISTLETOE, ROOT ROTS, AND HEART ROTS--WERE EXAMINED IN DETAIL.

SHEA, KEITH R. 12 68142
'FOMES ANNOSUS', A THREAT TO FOREST PRODUCTIVITY IN THE DOUGLAS-FIR SUBREGION OF THE PACIFIC NORTHWEST.
PROC. THIRD INT. FOMES ANNOSUS CONF., COPENHAGEN, DENMARK, 7 PP. (NO COPIES AVAILABLE)
'FOMES ANNOSUS' MAY CAUSE EXTENSIVE LOSSES AS A BUTT AND TRUNK ROT IN FUTURE FORESTS. INCIDENCE CAN BE EXPECTED TO INCREASE AS INJURIES AND STUMPS ASSOCIATED WITH THINNINGS PROVIDE ADDITIONAL INFECTION COURTS. RESEARCH IS URGENTLY NEEDED TO EVALUATE THE THREAT OF THIS NATIVE FUNGUS TO FOREST PRODUCTIVITY.

SHEA, KEITH R. 12 68141
PORIA ROOT ROT, PROBLEMS AND PROGRESS IN THE PACIFIC NORTHWEST. (ABSTR.)
FIRST INT. CONGR. PLANT PATHOL. (LONDON). 1 P. (NO COPIES AVAILABLE)

SILEN, ROY 11 68107
ATTEMPTS AT PRACTICAL CONTROL OF POLLEN CONTAMINATION. (ABSTR.)
IN 'ABSTRACTS OF PRESENTED PAPERS.' WEST. FOREST GENETICS ASS. ANN. MTG. 1968, PP. 4-5. (NO COPIES AVAILABLE)
COLD WATER SPRAY, BOTH TO PHYSICALLY REMOVE POLLEN FROM THE AIR AND TO RETARD DEVELOPMENT, APPEARED PROMISING IN REDUCING DOUGLAS-FIR POLLEN CONTAMINATION. TECHNICAL DIFFICULTIES WERE ENCOUNTERED WITH TRIALS OF ELECTRICALLY CHARGED OR WATER-SPRAYED PLASTIC SCREENS.

SILEN, ROY R. 08 67163
GENETIC JUNK. (ABSTR.)
WEST. FOREST GENET. ASS. MEET. 1967, P. 5. (NO COPIES AVAILABLE)
BECAUSE POLLINATION OF A DOUGLAS-FIR FEMALE STROBILI IS POSSIBLE OVER A 20-DAY PERIOD, SOME SEED CAN BE PRODUCED FROM EVERY STAND THAT MAY BE ADAPTED FOR GOOD GROWTH OVER A WIDE ELEVATIONAL RANGE. SUCH POORLY-ADAPTED SEED FOR LOCAL ENVIRONMENTS (GENETIC JUNK) MAY BE ADVANTAGEOUS AS A SURVIVAL TRAIT.

SILEN, ROY. 01 68110
SAMPLING OF POLLEN CONTAMINATION WITHIN NORTHWEST SEED ORCHARDS.
IFA TREE IMPROVEMENT NEWSLETTER NO. 7, PP. 5-13, ILLUS. (NO COPIES AVAILABLE)
SAMPLING OF POLLEN IN SIX DOUGLAS-FIR SEED ORCHARDS BETWEEN 1960 AND 1967 REVEALS CONTAMINATING DEPOSITS OF 1,219 TO 6,941 GRAINS PER SQUARE INCH DURING GOOD SEED YEARS.

SILEN, ROY R. 12 67143
HOW EARLY CAN DOUGLAS FIR CONE CROPS BE PREDICTED.
IN 'WESTERN REFORESTATION.' WEST. FOREST. AND CONSERV. ASS., WEST. REFOREST. COORDINATING COMM. PROC. 1967, PP. 12-18. ILLUS.
FORECASTS OF CROP FAILURE ARE POSSIBLE UP TO 17 MONTHS AHEAD OF SEEDFALL BY CORRELATING BUDS THAT DEVELOP ON THE MALE POSITION OF THE TWIG WITH FEMALE BUD PRODUCTION. FORECASTS OF A POTENTIAL CROP ARE LIMITED TO ABOUT 14 MONTHS AHEAD OF SEEDFALL BECAUSE MANY BUDS THAT START FAIL TO DEVELOP.

SKOVLIN, JON M., EDGERTON, PAUL J., AND HARRIS, ROBERT W. 09 68087
THE INFLUENCE OF CATTLE MANAGEMENT ON DEER AND ELK.
THIRTY-THIRD N. AMER. WILDLIFE AND NATUR. RESOURCES CONF. TRANS. 1968, PP. 169-179, ILLUS.
FORAGE USE RELATIONSHIPS OF DEER, ELK, AND CATTLE WERE STUDIED ON A PONDEROSA PINE-BLUNCHGRASS SUMMER RANGE IN THE CENTRAL BLUE MOUNTAINS OF NORTHEASTERN OREGON. FROM THE STANDPOINT OF TOTAL RESOURCE MANAGEMENT AND PROTECTION, CONSERVATIVE CATTLE STOCKING BETWEEN THE LIGHT AND MODERATE LEVEL WOULD GIVE GOOD OVERALL PRODUCTION FROM THESE MULTIPLE-USE RANGES.

*SMITH, MICHAEL G. 4 68056
RED SQUIRREL RESPONSES TO SPRUCE CONE FAILURE IN INTERIOR ALASKA.
J. WILDLIFE MANAGE. 32, PP. 305-317, ILLUS.
DURING 2 YEARS OF CONE CROP FAILURE, OLD CONES SUSTAINED SQUIRRELS FIRST WINTER, POPULATION DROPPED 67 PERCENT SECOND WINTER. WITHOUT CONES, MAIN DIET OF SPRUCE SEED WAS REPLACED BY MUSHROOMS IN SUMMER AND SPRUCE BUDS IN WINTER.

SORENSEN, FRANK. 08 67164
CONTROLLED SELF-POLLINATION AND SEED SET IN COASTAL DOUGLAS-FIR. (ABSTR.)
WEST. FOREST GENET. ASS. MEET. 1967, PP. 4-5. (NO COPIES AVAILABLE)
RELATIVE SELF-FERTILITY WAS ESTIMATED AT 12 PERCENT OF NORMAL SEED SET FOR 35 DOUGLAS-FIR TREES GROWING IN FIVE STANDS ALONG AN EAST-WEST TRANSECT THROUGH WESTERN OREGON.

STEIN, BILL. 03 68068
TIPS FOR FORESTERS IN SELECTING PROPER NURSERY TREES FOR PLANTING.
U.S.D.A. FOREST SERV., REG. 6, FIRST REFORESTATION WORKSHOP PROC. 1968, P. 163. (NO COPIES AVAILABLE)
EXTEMPORANEOUS COMMENTS POINTING OUT THAT A FOREST NURSERY IS A DYNAMIC PRODUCTION UNIT--THAT TENDING PRACTICES AND THE NURSERY STOCK PRODUCED IMPROVE FROM YEAR TO YEAR. CONSEQUENTLY, SEEDLING POTENTIALS CHANGE AND CURRENT-DAY SEEDLINGS MAY PERFORM BETTER IN THE FIELD THAN THOSE TESTED IN PRIOR YEARS.

STEIN, WILLIAM I., KRUEGER, KENNETH W., AND EDGREN, JAMES W. 03 68065
REFORESTATION IMPROVEMENT THROUGH RESEARCH.
U.S.D.A. FOREST SERV.,REG. 6, FIRST REFORESTATION WORKSHOP PROC. 1968, PP. 14-25. (NO COPIES AVAILABLE)
THE PRIMARY RESEARCH GOAL IN THE PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION'S SEEDING, PLANTING, AND NURSERY PRACTICE PROJECT IS TO MAXIMIZE THE SURVIVAL, VIGOR, AND EARLY GROWTH OF OUTPLANTED DOUGLAS-FIR NURSERY STOCK. COMPLETED STUDIES AND RESEARCH IN PROGRESS ARE DESCRIBED IN TERMS OF THEIR POTENTIAL CONTRIBUTION TO THIS GOAL.

STEIN, WILLIAM I. 12 67142
LABORATORY SEED TESTS--ARE THEY DOING THE JOB?
IN 'WESTERN REFORESTATION.' WEST. FOREST. AND CONSERV. ASS., WEST. REFOREST. COORDINATING COMM. PROC. 1967, PP. 20-23. ILLUS.
INSTANCES ARE REPORTED OF MARKED DIFFERENCES BETWEEN GERMINATION IN THE LABORATORY AND IN OUTDOOR SEEDBEDS, AND BETWEEN DIFFERENT KINDS OF LABORATORY VIABILITY TESTS. IMPROVEMENTS ARE NEEDED IN METHODS USED TO PREDICT SEEDS' PERFORMANCE IN USE.

STEIN, WILLIAM I. 12 67141
SELECTED PUBLICATIONS ON REFORESTATION.
IN 'WESTERN REFORESTATION.' WEST. FOREST. AND CONSERV. ASS., WEST. REFOREST. COORDINATING COMM. PROC. 1967, PP. 32-39.
COVERAGE INCLUDES MOST REFERENCES PERTAINING TO WESTERN SPECIES AND SELECTED OTHER REFERENCES HAVING GENERAL APPLICABILITY.

STRICKLER, GERALD S., AND *RUSK, HAROLD W. 08 68112
DDT RESIDUES IN SELECTED FORAGE SPECIES. (ABSTR.)
IN 'SURVEILLANCE REPORT 1965 BURNS PROJECT DOUGLAS-FIR TUSSOCK MOTH CONTROL.' PP. 17-19, ILLUS. (COPIES AVAILABLE ONLY FROM DIV. OF TIMBER MANAGEMENT, U.S.D.A. FOREST SERV., PACIFIC NORTHWEST REGION, PORTLAND, OREG.)

SWANSTON, DOUGLAS N. 8 68076
GEOLOGY AND SLOPE FAILURE IN THE MAYBESO VALLEY, PRINCE OF WALES ISLAND, ALASKA. (ABSTR.)
DISS. ABSTR. 28(12), PP. 5085-B, 5086-B.

TACKLE, D. 06 68084
MULTIPLE-USE PLANNING, GRAZING-FEE ASSESSMENT, FORAGE ALLOCATION AND STOCKING CONTROL--U.S. FOREST SERVICE METHODS.
EAST AFR. AGR. FOREST. J. 33 (SPEC. ISSUE), PP. 51-58, ILLUS.
DESCRIBES U.S. FOREST SERVICE SYSTEM FOR PLANNING MULTIPLE-USE MANAGEMENT FUNCTIONS, AND METHODS FOR ASSESSING LIVESTOCK FEES, ALLOCATING FORAGE TO LIVESTOCK AND WILDLIFE, AND CONTROLLING LIVESTOCK NUMBERS IN RELATION TO CARRYING CAPACITY.

TACKLE, DAVID, DIMOCK, EDWARD J., II, RADWAN, DR. M. A., AND CROUCH, GLENN L. 03 68067
ANIMAL PROBLEMS LABORATORY RESEARCH PROGRAM.
U.S.D.A. FOREST SERV., REG. 6, FIRST REFORESTATION WORKSHOP PROC. 1968, PP. 37-57. (NO COPIES AVAILABLE)
A BRIEF PRESENTATION OF CURRENT AND PROJECTED RESEARCH AT THE ANIMAL PROBLEMS LABORATORY ON THE THREE MAJOR PROBLEMS--ASSESSMENT OF ANIMAL DAMAGE IMPACTS, REDUCTION OF ANIMAL DAMAGE THROUGH USE OF CHEMICALS, AND REDUCTION OF ANIMAL DAMAGE THROUGH MODIFICATION OF THE FOREST ENVIRONMENT.

TARRANT, ROBERT F. 08 68113
FATE OF DDT IN FOREST FLOOR, LITTERFALL, SOIL AND WATER. (ABSTR.)
IN 'SURVEILLANCE REPORT 1965 BURNS PROJECT DOUGLAS-FIR TUSSOCK MOTH CONTROL.' P. 19. (COPIES AVAILABLE ONLY FROM DIV. OF TIMBER MANAGEMENT, U.S.D.A. FOREST SERV., PACIFIC NORTHWEST REGION, PORTLAND, OREG.)

TARRANT, ROBERT F. 01 68007
INFLUENCE OF INTRODUCED CHEMICALS.
IN 'WATER AND ENVIRONMENTAL QUALITY,' OREG. STATE UNIV. WATER RESOURCES RES. INST. SEMINAR (WR 008.67) 1967, PP. 33-46. (NO COPIES AVAILABLE)
THE CURRENT CONCERN OVER PESTICIDE RESIDUES IN WATER IS CONSIDERED TO BE ONLY ONE, ALTHOUGH IMPORTANT, SYMPTOM OF AN INCIPIENT MAJOR FOREST PROBLEM--POLLUTION, SPECIFICALLY CHEMICAL POLLUTION.

TARRANT, ROBERT F. 12 68135
SOME EFFECTS OF ALDER ON THE FOREST ENVIRONMENT. (ABSTR.)
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, P. 193.

TARRANT, ROBERT F., LU, K. C., BOLLEN, W. B., AND *CHEN, C. S. 10 68091
NUTRIENT CYCLING BY THROUGHFALL AND STEMFLOW PRECIPITATION IN THREE COASTAL OREGON FOREST TYPES.
U.S.D.A. FOREST SERV. RES. PAP. PNW-54, 7 PP.
THROUGHFALL AND STEMFLOW WERE COLLECTED BENEATH THREE ADJACENT FOREST TYPES--RED ALDER, CONIFER--DOUGLAS-FIR, WESTERN HEMLOCK, AND SITKA SPRUCE, AND A MIXTURE OF ALDER AND CONIFER. WEIGHT OF N AND DISSOLVED SOLIDS IN STEMFLOW WAS INSIGNIFICANT BECAUSE OF SMALL AMOUNTS OF STEMFLOW AND SOIL AREA AFFECTED. NUTRIENT CYCLING RATES DIFFER APPRECIABLY BETWEEN THE THREE FOREST TYPES.

TARRANT, R. F., LU, K. C., BOLLEN, W. B., AND FRANKLIN, J. F. 11 68115
NITROGEN ENRICHMENT OF TWO FOREST ECOSYSTEMS BY RED ALDER ('ALNUS RUBRA'). (ABSTR.)
AGRON. ABSTR. 1968, P. 139. (NO COPIES AVAILABLE)

TARRANT, R. F., LU, K. C., *CHEN, C. S., AND BOLLEN, W. B. 10 68102
NITROGEN CONTENT OF PRECIPITATION IN A COASTAL OREGON FOREST OPENING.
TELLUS 20(3), PP. 554-556.
PRECIPITATION WAS COLLECTED PERIODICALLY FROM JUNE 1963 THROUGH MAY 1964, NEAR OTIS, OREGON. TOTAL NITROGEN IN THE YEAR'S PRECIPITATION WAS 1.49 KG/HA (1.33 LB/A). OF THE TOTAL, 87 PERCENT WAS IN THE ORGANIC FORM, PRESUMABLY DERIVED FROM LOCALLY GENERATED, AIRBORNE ORGANIC DEBRIS. THUS, THE NITROGEN BROUGHT DOWN IN PRECIPITATION DID NOT CONSTITUTE A SIGNIFICANT ACCRETION TO THE NUTRIENT CAPITAL OF THE FOREST ECOSYSTEM.

TORGERSEN, TOROLF R. 9 68083
PARASITES OF THE HEMLOCK SAWFLY, 'NEODIPRION TSUGAE,' IN COASTAL ALASKA.
ANN. ENTOMOL. SOC. AMER. 61, PP. 1155-1158, ILLUS.
THE PRIMARY PARASITES OF 'NEODIPRION TSUGAE' MIDDLETON IN COASTAL ALASKA ARE HYMENOPTEROUS SPECIES REPRESENTING EIGHT GENERA. THE COMMONEST PRIMARY PARASITES ARE 'OPIONUS TSUGAE TSUGAE' (CUSHMAN), 'DELOMERISTA JAPONICA DIPRIONIS' CUSHMAN, AND 'ITOPLECTIS QUADRICINGULATUS' (PROVANCHER). TWO ADDITIONAL SPECIES, 'AMBLYMERUS VERDITER' (NORTON) AND 'GELIS' SP., ARE HYPERPARASITES. A KEY TO THE PARASITES, BASED ON ADULT CHARACTERS, IS INCLUDED.

TRAPPE, J. M., FRANKLIN, J. F., TARRANT, R. F., AND HANSEN, G. M. (EDS.). 12 68147
BIOLOGY OF ALDER.
NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 1-292, ILLUS.
TOPICS INCLUDE ASPECTS OF 'ALNUS' TAXONOMY, DISTRIBUTION, ECOLOGY, SOIL AND MICROBIOLOGICAL RELATIONSHIPS, PHYSIOLOGY, AND GROWTH AND YIELD.

*TU, C. M., AND BOLLEN, W. B. 03 68049
EFFECT OF PARAQUAT ON MICROBIAL ACTIVITIES IN SOILS.
WEED RES. 8(1), PP. 28-37, ILLUS. (NO COPIES AVAILABLE)
EXCEPT FOR A TEMPORARY SUPPRESSION OF NITRIFICATION, PARAQUAT HAD NO SIGNIFICANT EFFECT ON MICROBIAL ACTIVITIES OF IMPORTANCE TO SOIL FERTILITY.

*TU, C. M., AND BOLLEN, W. B. 03 68048
INTERACTION BETWEEN PARAQUAT AND MICROBES IN SOILS.
WEED RES. 8(1), PP. 38-45. (NO COPIES AVAILABLE)
UNDER CONTROLLED CULTURE CONDITIONS, 'AEROBACTER AEROGENES, AGROBACTERIUM TUMEFACIENS, PSEUDOMONAS FLUORESCENS,' AND 'BACILLUS CEREUS' WERE ABLE TO USE PARAQUAT AS SOLE CARBON AND NITROGEN SOURCES IN SYNTHETIC MEDIA. WHEN USED AT RECOMMENDED RATES, PARAQUAT HAD LITTLE EFFECT ON SOIL MICRO-ORGANISMS.

*VERNETTI, JACK B., AND NORRIS, LOGAN A. 08 68114
FIELD VOLATILITY OF DDT. (ABSTR.)
IN 'SURVEILLANCE REPORT 1965 BURNS PROJECT DOUGLAS-FIR TUSSOCK MOTH CONTROL.' P. 19. (COPIES AVAILABLE ONLY FROM DIV. OF TIMBER MANAGEMENT, U.S.D.A. FOREST SERV., PACIFIC NORTHWEST REGION, PORTLAND, OREG.)

WALL, BRIAN R. 10 68095
1967 OREGON TIMBER HARVEST.
U.S.D.A. FOREST SERV. RESOURCE BULL. PNW-27, 2 PP., ILLUS.
CHRONICLES TIMBER HARVEST FOR 1950-67 AND GIVES DETAIL BY COUNTIES FOR 1967.

WALL, BRIAN R. 8 68074
1967 WASHINGTON TIMBER HARVEST.
U.S.D.A. FOREST SERV. RESOURCE BULL. PNW-25, 2 PP., ILLUS.
CHRONICLES TIMBER HARVEST FOR 1950-67 AND GIVES DETAIL BY COUNTIES FOR 1967.

WILLIAMS, CARROLL B., JR. 12 68144
JUVENILE HEIGHT GROWTH OF FOUR UPPER-SLOPE CONIFERS IN THE WASHINGTON AND NORTHERN OREGON CASCADE RANGE.
U.S.D.A. FOREST SERV. RES. PAP. PNW-70, 13 PP., ILLUS.
DOUGLAS-FIR GENERALLY EXHIBITED MORE RAPID JUVENILE HEIGHT GROWTH THAN WESTERN WHITE PINE AND NOBLE AND PACIFIC SILVER FIRS ON UPPER-SLOPE CLEARCUTS. PACIFIC SILVER FIRS GREW SLOWEST EVEN THOUGH MOST WERE ESTABLISHED PRIOR TO LOGGING THE OVERSTORY, IN CONTRAST TO OTHER SPECIES. ALTHOUGH HEIGHT GROWTH OF PACIFIC SILVER FIR INCREASED DRAMATICALLY FOLLOWING LOGGING OF OVERSTORY, IT WAS EXCEEDED BY GREATER HEIGHT GROWTH OF LESS SHADE-TOLERANT SPECIES.

WILLIAMS, CARROLL B., JR. 7 68071
SEASONAL HEIGHT GROWTH OF UPPER-SLOPE CONIFERS.
U.S.D.A. FOREST SERV. RES. PAP. PNW-62, 7 PP., ILLUS.
TIME OF BUD BURST AND SEASONAL DISTRIBUTION OF HEIGHT GROWTH WERE STUDIED FOR 2 CONSECUTIVE YEARS ON EIGHT CONIFEROUS SPECIES GROWING IN ASSOCIATION ON TWO UPPER-SLOPE AREAS IN THE OREGON CASCADES. AT EACH AREA, SIGNIFICANT VARIATIONS BETWEEN SPECIES AND YEARS GENERALLY WERE FOUND FOR INITIATION OF BUD BURSTING, LENGTH OF GROWING SEASON, AND 50-, 90-, AND 100-PERCENT COMPLETION OF GROWTH. TOTAL HEIGHT GROWTH SEEMED TO BE RELATED TO LENGTH OF CURRENT GROWING SEASON, PARTICULARLY FOR THE TRUE FIRS AND MOUNTAIN HEMLOCK.

WILLIAMSON, RICHARD L. 12 68136
PRODUCTIVITY OF RED ALDER IN WESTERN OREGON AND WASHINGTON.
IN 'BIOLOGY OF ALDER,' J. M. TRAPPE, J. F. FRANKLIN, R. F. TARRANT, AND G. M. HANSEN (EDS.). NORTHWEST SCI. ASS. FORTIETH ANNU. MEETING, SYMP. PROC. 1967, PP. 287-292, ILLUS.
RED ALDER IN WESTERN OREGON AND WASHINGTON GROWS RAPIDLY WHEN YOUNG AND OUTPRODUCES DOUGLAS-FIR UP TO AGES 25-30 YEARS ON MEDIAN SITES OF BOTH SPECIES. RED ALDER READILY RESPONDS TO THINNING. ITS ABILITY TO ADD NITROGEN TO SOIL IS IMPORTANT FOR SITE IMPROVEMENT OVER MUCH OF ITS NATURAL RANGE.

WITTIG, GERTRAUDE. 3 68057
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